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AN EXPERIMENTAL STUDY UTILIZING CLOSED CIRCUIT TELEVISION IN AN INDUSTRIAL ARTS TEAM TEACHING PROGRAM. FINAL REPORT.

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BASIC OBJECTIVES OF THIS EXPERIMENT WERE TO USE TEAM TEACHING BY TV TO HELP STUDENTS GAIN A REALISTIC VIEW OF THE INDUSTRIAL PROCESS AND OF THE IMPORTANCE OF EDUCATION AND TRAINING FOR PARTICIPATION IN THAT PROCESS. GRADE EIGHT STUDENTS IN AN INDUSTRIAL COMMUNITY WERE PLACED IN AN EXPERIMENTAL AND A CONTROL GROUP, AND EXPOSED TO INSTRUCTION FROM THE SAME TWO TEACHERS DURING ONE SCHOOL YEAR. STANDARDIZED ABILITY AND INTEREST TESTS WERE ADMINISTERED DURING AND AFTER THE EXPERIMENT, AND ACHIEVEMENT TESTS AND TEACHER EVALUATIONS WERE USED THROUGHOUT THE YEAR. DESCRIPTIVE STATISTICAL DATA SHOWED SIGNIFICANT INCREASES IN MECHANICAL INTEREST BY THE EXPERIMENTAL GROUP, AND INCREASES IN TECHNICAL KNOWLEDGE BY THE CONTROL GROUP. MECHANICAL ABILITY OF BOTH GROUPS INCREASED AT ABOUT THE SAME RATE. THE LIVE TV AND VIDEO-TAPED DEMONSTRATIONS PRESENTED TO THE EXPERIMENTAL GROUP WERE DEEMED VERY EFFECTIVE BY BOTH TEACHER EVALUATION AND STANDARD TEST RESULTS. RESULTS OF THE USE OF PERSONALITY INVENTORIES WERE QUESTIONED. IT WAS RECOMMENDED THAT THE PROJECT BE EXTENDED A SECOND YEAR TO PRECLUDE A POSSIBLE "HAWTHORNE EFFECT." (LH)

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FINAL REPORT

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August 23, 1967

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

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Charles E. Jaquith

Robert Baetz   Robert Desmarais

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Finally, I would like to acknowledge the hard work and the dedication of our investigators, Robert Baetz and Robert Desmarais. There are very few guidelines for the type of work involved in this project. These two men have been creative in developing new procedures which will be of value to others desiring to establish similar programs.

Charles E. Jaquith
Project Director

INTRODUCTION

The field of industrial arts education in the secondary public schools has not been utilized for research involving television. As a result, we have found few guidelines to assist us in the preparation of materials or lessons in this project. Lelan LeMaster used films to show that students could learn manipulative skills and technical knowledge more effectively than with the traditional demonstrations.(1) His conclusions were based on written tests. Vance Snyder has shown that filmed teacher demonstrations more effectively improved perceptual motor skills than the conventional personal demonstrations.(2) His conclusions were formulated after a panel of evaluators reacted to progress in the control and experimental group. Other researchers have found that television properly used can increase knowledge at least as effectively as direct instruction in areas other than industrial arts. We were concerned, however, to find little evidence of research in the use of television to influence course related attitudes.

Apparently most visual research in the area of industrial arts relates to films. It is our belief that television and the video tape recorder represent a far more flexible teaching tool than films. We feel that this tool becomes even more effective when used in a team teaching situation. (Note: As a second side of our project, we compared team teaching with the traditional unit shop approach both with and without television. While this was not the major purpose of this research project, we did find a significant improvement in instruction and in learning where the team approach was used. The unit shop class utilizing television obtained higher performance grades on standardized tests and on projects constructed, than did the unit shop without television. Both the control and experimental team teaching classes performed better than either unit shop in terms of behavior, attitude, and performance. In that the major premise of this project relates to team teaching, the author will make no further comment related to the unit shop approach.)

The somewhat late release of funds created a delay in the initiation of the project. Late arrival of equipment and technical problems created additional delays, and so we were not able to complete all of our planned activities. We did, however, complete enough of the project to realize that we have found an exciting new approach to industrial arts education.

In the first place, team teaching in industrial arts is relatively new. Less than 1% of the secondary schools have any program in industrial arts which might be called team teaching. In our situation, we have two teachers involved. Mr. Robert Baetz specializes in woods and plastics, while Robert Desmarais is prepared in metals and electricity. We have found that this approach has enabled the students to benefit from instruction from specialists in industrial areas, yet they could also work on projects which involved cutting across media lines. (i.e., They could combine plastics with metals or wood with plastics and electronics.) By using live television and our own video tapes, we have been able to improve the effectiveness of the instructors to a remarkable extent. The students have responded well both to the team teaching approach and to the use of television. The cooperation of the instructors has resulted in better organized instruction.

The objectives in this project reflect the concerns of industrial arts teachers across the nation as listed by Dr. Marshall Schmitt.[3] He indicates the problems in order of difficulty are:

1. Keeping up with advances in technology.

2. Arranging and conducting field trips.

3. Finding adequate preparation time for experiments and demonstrations.

4. Finding time to help individual students.

5. Providing for the slow learner.

6. Providing career guidance concepts in industry.

7. Acquiring and teaching modern concepts of industry.

Our objectives nearly match these problems although we did not read this data until after our project was initiated. Our objectives were to:

1. Make more effective a team teaching approach in an industrial arts class situation.

2. Increase the knowledge and appreciation of the industrial process and products in our American economy.

3. Make more effective use of the physical plant including equipment.

4. Make more effective use of teacher time.

5. Improve the students manipulative skills in industrial areas.

6. Eliminate repetitious demonstrations to provide more time for individual instruction through video taped demonstrations which could also serve for make-ups for absentees and slow learners.

7. To develop a closer cooperation and better understanding between industry and industrial education and through these improved relationships to gain permission to video tape new industrial processes to update teacher knowledge, show practical application of industrial arts skills, and to eliminate, at least partially, field trips.

Kenosha is an industrial city. About forty-five percent of our youngsters find careers in local industry. Of necessity, our industrial arts program is oriented toward industry. In our project we have gone into local industries video taping various technological processes related to our industrial arts curriculum. We have shown details which students could not see on field trips because the television camera can get closer than students would be allowed due to safety factors. Working closely with plant engineers, our instructors have been able to update their own knowledge of industrial and technological processes and procedures. Because much of the time of parents in this community is spent before television sets, the television set in the industrial arts classroom speaks with authority. One student viewing an industrial tape saw his father working. He commented that this was the first time he had realized what his father did in the factory.

It is the basic purpose of this project to utilize television in a team teaching industrial arts program to help students realistically grasp the nature of the industrial process and to come to a fuller realization of the education and training necessary to find a place in the technology of ever changing modern industry. We hope early vocational orientation will assist to reduce the dropout rate in the senior high school. To do this, we feel that the industrial arts classroom must present opportunities to develop knowledge and skills through activities with practical applications. We are concerned about helping students to make realistic vocational choices and to plan wisely for career preparation. We believe the key to our program is improved motivation of the students and more effective use of teacher time as well as the shop equipment.

It is our hypothesis that using television in a team approach to industrial arts education will enable us to accomplish the purposes we have outlined. If our students come out of the program with an increased respect for and knowledge about American industries, we will have gained our objective. We consider these objectives to be worthwhile for both the college preparatory and the non-college student.

METHODOLOGY OF THE PROJECT

(a) In Structuring the Experiment

To assure the validity of project results, we were concerned that the control and experimental groups were matched in terms of intelligence and background experience in industrial arts. At the initiation of the project, both groups were quite well matched in terms of intelligence as determined by the Otis:Beta Form EM Intelligence Test. Both groups had an IQ range of 70 to 128 with a median of 106. During the year, however, increasing enrollment necessitated the employment of additional teachers and a change in the master schedule. This unfortunately changed the schedules of a number of the students involved in the research project and skewed the intelligence distribution in favor of the experimental group.

At stake was the balanced operation of the entire school as opposed to the maintenance of the distribution of students in our research project. We were able to maintain both groups with a common experience background. All students in both groups had had identical seventh grade experiences and despite the disparity of intelligence scores, had very similar performance grades in seventh grade industrial arts.

We decided to proceed with the project despite the unbalance in intelligence distribution. After thorough consideration, we felt we could establish valid results by keeping this factor in mind when we tried to formulate our conclusions. The experimental groups met with instructors one period. They made intensive use of teacher demonstration both on live television and on teacher produced video tapes. The experimental group was not to take field trips but would view video tapes of local industrial processes. The control group viewed only personal demonstrations and also participated in a field trip to local industries. Both groups had the same instructors and followed an identical program of studies. Both did the same projects and took the same tests. We tried to eliminate all variables but the use of television and the video tape recorder.

As indicated in the introduction, we also attempted a second project to compare the use of team teaching with the unit shop. These classes contained the boys who had had no industrial arts background and those not included in the project.

(b) Evaluation Procedures

In any research project it is essential to have reliable instruments to evaluate how effectively progress is made toward the attainment of the objectives. We wanted to assess the following:

1. Increase or decrease in interest in industrial processes.

2. Increase or decrease in mechanical ability.

3. Changes of attitudes toward industrial vocations.

4. Any changes in self concept as related to community relations, personal and social adjustment.

5. Increases in technical knowledge.

6. Improvement in manipulative ability

To assist us, we obtained the services of a consultant on evaluative procedures. He worked with us for two days on the selection of standardized tests, the construction of reliable test instruments, and the determination of valid evaluation procedures.

We decided to administer a number of standardized tests* and our own technical knowledge test at the beginning and end of the project. We were delayed in using the tests in that they had to be approved by the Office of Education, but the initial tests were still early enough to allow sufficient time to measure changes at the end of the program.

The tests used were as follows:

California Picture Interest Inventory-Mechanical Interest Subtest

We used this test to eliminate the variable in interest which might be attributed to low reading ability. It also gave us needed information for vocational guidance.

California Prognostic Test of Mechanical Ability

We used this test because we felt that with an increased experience in the area of mechanics and technology, we should be able to raise mechanical ability scores.

California Personality Test-Subtests on Personal, Social and Total Adjustment plus Community Relations

These tests were used to give us a better picture of the self concept of the students and the image of their relationship to the community.

Technical Knowledge Test**

Our instructors developed this test to measure knowledge of tools and materials used in the areas of Woods, Metals, and Electricity.

We also kept records of achievement on unit tests during the year to compare the knowledge gained between the control and experimental groups. To evaluate gains

*See Appendix A and Appendix B for statistical summaries of test results.

**See Appendix D for a sample of the Technical Knowledge Test.

in manipulative skills, we kept a progress record of grades on projects for both groups.

We worked closely with the building counselors to accurately interpret test results to the students for vocational guidance. Incidentally, the Picture Interest Inventory gave our instructors a real insight as to why some boys failed to achieve satisfactorily.

We statistically determined the correlation between mechanical interest and ability for both groups at the beginning and the end of the project. We also compared the range of scores, medians, means, the modes, and standard deviations for all test scores and project grades between both groups at the beginning and end of the project.

Our only reservation was in the use of the Personality Tests. We are not convinced of the validity of some of the results as contrasted with our knowledge of the students. In all other respects, we believe our evaluation procedures to have effectively measured progress toward the attainment of our objectives.

(c) In Using Television Equipment

Despite the fact that the decade between 1954 and 1964 has been characterized as the era of most intensive research on instructional television,[4] there are still a number of technical problems to be faced by educators operating television equipment. Problems in impulse synchronization and balance of signal output between different units is critical. Refinement in the video tape recorders is still being worked on. There are currently few standards in quality control between different manufacturers. There is no compatibility between one brand and another. It would be our recommendation that school systems expend a minimum investment in equipment at this time pending standardization and improvement of equipment.

Our approach to television utilizes the "Mobile Studio Concept". In our building any room can either receive or transmit television signals. We have a closed circuit system which distributes our own programming or outside programs from educational or commercial TV sources. Our transmitter and audio-visual modulator are mounted on a mobile cart along with the external sync-generator so that we can transmit live programs or make video tapes with one or two cameras. Our cameras have internal sync-generators and produce a fixed interlace signal for independent work. We transmit both the audio and video signal along a single co-axial cable. Appendix E lists each of the equipment items used in our television work.

We televised live demonstrations when we wanted students to see the magnification of details such as soldering electronic circuits, buffing and polishing metal and cutting plastic. In this type of presentation we had the students watching the instructor begin the demonstration, then turned on the cameras to show a close up of his hands in action. We were not as pleased with these presentations as those we video taped.

Video taped demonstrations were prepared outside of class. For these demonstrations, the instructors prepared charts, labels and other visual aids. We used a title and background music to initiate the lesson. We found that we did a better job on tape because the instructors could play it back immediately after taping it for a joint critique session. Improvements and changes were made by retaping. Generally, our demonstrations did not last more than ten minutes. Video taping the demonstration meant that equipment would not be tied up for demonstrations during class time. Part of the students used the equipment while the others were viewing the demonstration. Students absent or students needing repeats of demonstrations could view them without keeping others from the machinery being shown on the tape. We video taped series of demonstrations in metal work, electricity, and plastics. The control group watched only in person demonstrations; the experimental group watched primarily taped demonstrations. Both the live television and the video tape demonstrations viewed by the experimental group utilized two cameras. Television equipment was operated by other staff members and trained student helpers. From time to time, we utilized the services and technical advice of audio-visual consultants. Lighting problems and camera techniques evolved slowly, but we became more effective as the year progressed.

To go into local industries to produce video tapes of related industrial processes presented a number of problems. We had to first obtain permission from management. To accomplish this, we met with representatives of the Kenosha Manufacturers' Association to explain our program. It was agreed that we would visit one factory to produce a pilot tape which would be shown to the entire group with an explanation of our request. Our first tape was made at Snap-on Tools.

In this tape we wanted to trace the production of a wrench from the drawings in the engineering room through the cutting of dies, the forging and press processes, the polishing, curing and final plating. We visited the factory to develop a sequence plan and to meet with the engineer who explained what was happening at each phase. In planning our procedures, we agreed to tape the sound with the picture in all areas but the forging shop. We developed a pattern of interviews between the two instructors and the engineer. The engineer would describe what the camera was viewing while the instructors asked questions which related what was being viewed to processes being taught in our program. At all times, safety was stressed. We also stressed the training required to perform a task. One high point in the tape was reached when the instructors asked, "How long does it take to become a die cutter?" The engineer replied, "Let's ask George! George, how long did it take you to become a die cutter?" "Eight years", was the answer. "I guess that tells a story", the engineer commented, "We just don't find these 'boys' under every tree."

In the forging shop the noise was so great that verbal communication was impossible. The vibrations from the drop forges literally shook the floor and the camera tripod bounced so, pictures were impossible. We devised a shoulder harness to carry the camera and the body of the camera carrier became the shock absorber. We taped the entire forging shop using only hand signals for communication. We did not record the audio on the video tape but dubbed in comments later in a more quiet area. To add realism, we did record some of the sound on a regular tape recorder and re-recorded it on to the tape, synchronized with some of the action on the tape. (Note - When we took the boys on a field trip to the factory, they could not go into the forging shop because of safety factors.)

We attended a luncheon meeting as guests of the Kenosha Manufacturers' Association. After showing the tape and explaining our project, we received an open invitation to come to any factory to produce tapes. We did not shut down production although our presence created a stir. Several workers conscientiously combed their hair although we were focusing only on their hands. Of some interest was the fact that visits to factories have to be cleared with labor organizations as well as management. One union steward was not aware of our clearance and accused us of being time study specialists. In some cases we did find procedures which could be better organized, but we made no comments to this effect.

Our industrial video tapes included the semi-automated production of metal gas tanks on the American Motors tape; the Snap-on Tools tape; the injection moulding of plastics for commercial vacuum cleaner covers at Racine Industrial Products; and the construction of electronic circuitry at the Dynamatic Division of Eaton, Yale and Towne, Inc. The tapes on plastics involved a different technique. We taped only the pictures and added the entire commentary and background sounds back at our school. Although this approach was good and the commentary clearer, this technique did not produce the realism of the "in-the-shop" audio and video taping. The interview technique, with engineers and employees adding comments, added interest to what was being said.

The process for production of industrial tapes might be boiled down to the following:

1. Take the television team to the industry and tour the factory or section of the plant appropriate to the processes which are desired for taping.

2. After the tour, sit down with the engineer to determine points to emphasize and best camera angles.

3. Map out an outline of dialogue which includes the sequence and approximate time allocation for each production phase to be taped.

4. Be sure all channels of permission are cleared.

5. Return to the plant and make the tape.

6. Have the television team review the tape with industrial representatives for errors, needed changes in sequence, or other problems.

7. Copy the tape on another video tape recorder but edit it into the proper sequence with all errors corrected.

8. The tape is then ready for use in the class at the appropriate time.

After we completed the editing, we made it a practice to invite management, engineers, and employees, involved in producing the tape, to visit the school to view the results over coffee and cookies. We found that this made them feel a real part of the instructional process, and all who viewed our productions have become television boosters. One industry has ordered its own video tape recorder and a camera to produce in-service training tapes.

(d) In Team Teaching in Industrial Arts

The two industrial arts teachers who made up the teaching team jointly planned the program for the year. The program was based on industrial arts objectives, student needs, and the community environment. In an analysis of the program, they found that its objectives conformed to the purposes of industrial arts emphasized by teachers and principals in public secondary schools in the United States as reported in a USOE survey.(6) The unit offerings within the program were also checked with the same survey, and they were found to be well above national norms.

The facilities for teaching the program were new and were designed with suggestions from the industrial arts staff to be most efficient for a comprehensive junior high program. In addition, the facilities were designed for a team-teaching situation. That is, the teaching team is able to carry on a large group activity with both instructors supervising or is able to break the group into smaller units for more individualized instruction. The adjoining classroom was adequate for combined class lectures and demonstrations, and also was used for special group or individual instruction, testing, display area, or special programs. The instructors' offices were available for members of teams to meet with individuals for conferences or counseling. Finally, there was adequate room and wiring so that television equipment could be used in all areas and be stored out of the way of classes not using it.

With these facilities the instructional team felt they were able to carry on the research in addition to the regular industrial arts program without sacrificing any of the inherent benefits of the established program. A special effort was made to see that the quality of instruction was the same for all groups. No mention of research or special grouping was made to the classes. The television equipment was handled as inconspicuously as possible to try to get normal reactions from students.

In each instructional area, one of the team instructors was given the responsibility for selecting and planning the work for that area. This arrangement was made to obtain continuity in the subject matter and to take advantage of the individual abilities and preferences of instructors. Whether the instructor was to function as a team leader co-leader, or an an assistant depended on the course of study and the daily lesson plan.

To adequately cover the material in the course, the teaching team compiled a list of necessary demonstrations. Demonstrations from this list were analyzed to determine the best method of presenting each lesson. The aim was not to use the television equipment just for the sake of using it but to use it only when there was a justifiable educational advantage. The criteria used for the decision on whether or not to use TV was as follows:

1. Are there any advantages of TV over personal demonstrations?

    a. Would there be improvement by close-up viewing and magnification?

    b. Would there be improved use of other visuals, such as labels, drawings, diagrams, anaimation, etc.?

2. Would the physical location of instructor or students be better with the use of TV equipment?

    a. Could the demonstration be given without interrupting shop activities?

    b. Would the students be able to see, hear, and take better notes?

    c. Would any safety hazards be eliminated?

3. Would the demonstration be repeated a number of times?

4. Would the instructor, or specialist be available to repeat personal demonstrations?

5. Would the necessary recording equipment and personnel to operate it be available?

Some demonstration tapes were made just as the instructor would give a live person to person demonstration. These tapes were acceptable and were used, but to take full advantage of a video tape, additional refinements were required. An analysis of what was to be shown, how it could best be presented, what items would need elaboration and detail, and what terms would need explanation represent some of the refinements. In addition, special visual materials (signs, diagrams, drawings, etc.) are needed to take advantage of the ability of the TV equipment to show them. To tie the demonstration together, special attention was given to the introduction and summary. Background audio-sound or background music was used for special effects.

The demonstration tapes were critically reviewed before they were shown. In this critique, each tape was evaluated to make sure that it covered what it was supposed to, and to make sure of its clarity and correctness. An assessment was made as to whether the material had been presented in the best possible manner. The industrial arts department now has a backlog of demonstrations which are available for future use by our department and by other schools.

With the demonstrations on tape, viewings could be scheduled at the most appropriate time for the students. They could be shown without any interruption of class work. Any individual or special group could be shown the tape whenever the situation demanded. The instructional team attempted using this flexibility of scheduling to get the student to view the tape at a time when it would be most helpful to him in his individual work.

The team of instructors in the classroom or in the shop was used in an attempt to solve some educational or management problems. For instance, critical supervision of students on machines or working with tools went on uninterrupted with one instructor available to take care of the routine classroom interruptions, such as emergency repairs, visitors, or individual conferences. When one instructor presented a lecture, demonstration, or test to the entire group, the other instructor was able to assist, or to do additional preparation work for future activities. There was also time for one instructor to work on a vocational guidance program using tests and individual conferences.

The teaching team worked together in daily conferences over what was scheduled, what objectives were to be met, and what problems were involved. Mutual agreement was reached on how best to handle particular units or lessons. Shop organization and management problems were worked on together to achieve the shop efficiency needed with two instructors working as a team. A standardized plan had to be established for shop maintenance and care in order for operations to continue smoothly.

(e) Vocational Guidance

Although not one of the original objectives of this research project, one of its results has been the development of a better vocational guidance program within the industrial arts department. To measure changes in mechanical ability and aptitude, comprehensive tests were given. (See Appendix (a) for data.) The results of these tests along with the student's personal inventory of his hobbies, achievements, and aspirations provided an insight into the individual's vocational potential not usually discovered in an ordinary industrial arts class program. This information gathered together in a file for each student has become the basis for our vocational guidance program.

The vocational guidance folders gave the student significant information about himself and stimulated some thinking about future plans. It made it possible for some students to make more enlightened decisions about school electives for the coming year. On the basis of their own profile in the vocational guidance folder, several boys decided to change their program to one that adapted more advantageously to their vocational aptitudes and aspirations.

The vocational information was a revelation to the instructors. Combined with additional information from the guidance department, the instructors were better able to understand some of the problems of individual students. The vocational folders helped in planning work for individual students and were a significant aid in planning remedial work for students with difficulties in mechanical aptitude.

This vocational folder will continue on with the students and hopefully will be added to and evaluated each year. This information is expected to be of real value in the counseling of problem students and potential drop-outs who have difficulty in relating the value of education to themselves in their life's work.

(f) The course Schedule for the Year

(Note: This is the schedule for the experimental group. The schedule for the control group is identical except there is no use of television or the video tape recorder.)

First Week — September 7-9

1. Roll call
2. Assignment of lockers
3. Clothing regulations - aprons
4. Explain curriculum for school year
5. Shop tour
6. Requirements of shop procedures
7. Grading procedure
8. Safety

   a. Discuss safety procedures

      1. Hand out safety sheets

   b. Assignment - Read Unit I and II - Text Introduction to General Metals, Author - John L. Feirer, McGraw-Hill, 2nd Edition 1959

   c. Look for five unsafe items or practices at home, and if possible, correct them.

9. Both instructors working together
10. Neither group was informed at any time during the course that an experimental program was being carried out.

Second Week — September 12-16

1. Technical Knowledge Test - Woods) Both
2. Technical Knowledge Test - Metals) instructors
3. Technical Knowledge Test - Electricity)

4. Hand in assignments) (Desmarais planned demon-
5. Safety Test)Baetz stration-Cutting of
6. Review lesson and test) Aluminum-Live, TV Equipment not available yet)

Third Week — September 19-23

1. Introduction to Metals) Baetz (Desmarais planned
2. Hand out sheets) demonstration- Cutting of Aluminum - Live)

   a. Specifics of Metal)

3. Unit 3 of Text Book

   a. Design in metal work) Desmarais (Baetz planned demonstration on filing and buffing which was taped)

4. Work on project) Both instructors giving individual help

Fourth Week — September 26-30

1. Project Design) (Baetz planned demonstration Bending-taped)
2. How to read a drawing and make a shop sketch) Desmarais
3. Discuss project-combination gauge)

4. Assignment-Read Unit 5 Text-"Reading and Making a Shop Sketch")
5. Review Unit 5)
6. Hand out direction sheets and discuss) Baetz

   a. Steps in construction) (Desmarais made plans for taping American Motors)
   b. Plan of procedure)
   c. Making job sheet)
   d. Making simple layouts)
   e. Properties of metal)

7. Layout project on graph paper to size)

8. Demonstration-Cutting of Aluminum-Live) Desmarais

   a. Shears) (Baetz supervised class)
   b. Hack saw)
   c. Beverly shears)
   d. Jig saw - with special blade)

9. Work on project) Baetz helped individuals with layout and general supervision. Desmarais supervised cutting of aluminum.

Fifth Week — October 3 - 7

1. Demonstration-Video taped) Baetz

   a. Filing metal) (Desmarais helped in class supervision)
   b. Buffing)

2. Work on Project) Both instructors working with individual help

Sixth Week — October 10-14

1. Work on project) Both instructors giving individual help

2. Projects due - Joint grading on projects

   a. Criteria

1. Size
2. Proper angles and placement of holes
3. Workmanship
4. Finish

3. Taped Snap-on Tools 7:00 a.m. (Followed wrench from drawing board to finished product) - related skills

    a. Drafting
    b. How to read a drawing and shop sketch
    c. Drilling
    d. Filing
    e. Buffing

<u>Seventh Week</u> <u>October 17-21</u>

1. Review project on sheet metal

    a. Problems involved
    b. Improvements

2. Explained new project - planter box)
3. Project design of planter)
4. Hand out instruction sheets and discuss) Baetz)

    a. Steps in construction)
    b. Plan of procedure)
    c. Job sheet)

Desmarais planned taped demonstration - Soldering

5. Work on sheet metal drawings layout.) To be handed in for approval) Desmarais
6. Scribe planter on metal)

Baetz charted scores on master copy

7. Review for Test I)

    a. Layout)
    b. Plan of procedure)
    c. Steps in construction) Baetz

8. Test I - Sheet Metal)
9. Review test and results)

Desmarais planned demonstration Riveting - Live with TV

10. Tape American Motors - 3:30 Sheet Metal gas tank line - Related to skills in shop

    a. Cutting
    b. Forming
    c. Trimming
    d. Soldering
    e. Quality control

Eighth Week — October 24-28

1. Demonstration
   Bending - Live with TV) }Baetz — Desmarais assisted A.V. boys with camera and general supervision
   a. Box and pan brake
   b. Hand bender

2. Demonstration Riveting) } Desmarais — Baetz - General supervision
   a. Tinners
   b. Pop

3. Work on project - Instructors giving individual help

Ninth Week — October 31-Nov. 4

1. Demonstration - Soldering)
   Video taped }Desmarais — Baetz charted grades on master copy
   a. Iron
   b. Gun

2. Show American Motors Tape
3. Work on project-Both instructors giving individual help
4. Teachers' Convention

Tenth Week — November 7-11

1. Lay out projects and clean shop for Building Dedication Program*
2. Work on project-Instructors giving individual help
3. First marking period ends

Eleventh Week — November 14-18

1. Discuss and demonstrate }Baetz — Desmarais planned electricity unit
   a. Decorating project
      1. Lacquer
      2. Ceramic Tile

2. Work on project- Individual help, both instructors

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*Dedication was video taped -Length of tape - 45 min.- covering all subject areas. Both instructors assisted in making of tape.

Twelfth Week — November 21-23

1. Film -Commercial "Steel and America") Desmarais
2. Review for test on planter box)Baetz planned
3. Test on planter) electricity
4. Review test results) unit

5. Work on project-both instructors, individual help
6. Thanksgiving recess

Thirteenth Week — November 28-December 2

1. Discussion - Bench metal)
2. Discuss project) Desmarais planned
)Baetz lesson on
   a. Option) layout
)
      1. House number bracket)
      2. Candle holder)

3. Layout assignment-Layout to size) Baetz recorded
) scores on
   a. Square)Desmarais master
   b. Rectangle) copy
   c. Triangle)
)
4. Layout project to scale)

5. Demonstration - Live TV) Baetz -
) Desmarais General
   a. Cutting of heavy stock) Supervision
)
      1. Hack saw)

6. Work on project - Both instructors, individual help

Fourteenth Week — December 5-9

1. Film-Commercial "Copper") Baetz prepared
2. Demonstration-Bending-Live) Desmarais demonstration
) Fastening
   a. Diacro bender)

3. Demonstration-Fastening-Live) Desmarais
)Baetz General
   a. Rivets) Supervision

4. Work on projects-Individual help-both instructors

Fifteenth Week — December 12-16

1. Assignment Text

   a. Diacro bender

1. Text p. 98-99-Answers to be) handed in-Quest. 1,2, 5, 8, 9, 10)Baetz — Desmarais worked on electrical unit

2. Work on project-Individual help, both instructors
3. Test-California Test of Picture Interest
   Test-California Test of Personality
   Test-California Test of Mechanical Abilities

<u>Sixteenth Week</u> — <u>December 19-20</u>

1. Work on project-Individual help
2. Christmas vacation

<u>Seventeenth Week</u> — <u>January 4-6</u>

1. Show video tape-Snap-on Tools
2. Work on project-Individual help,both instructors

<u>Eighteenth Week</u> — <u>January 16-20</u>

1. Film-commercial "Henry Ford" (Mass production, etc.)
2. Work on project-Individual help,both instructors

<u>Nineteenth Week</u> — <u>January 23-27</u>

1. Review for nine-week test)
2. Test)Baetz — Desmarais planned electrical unit
3. Review test result)
4. Work on project-Individual help,both instructors
5. Project due
6. Joint grading

   a. Criteria

      1. Size
      2. Design
      3. Fastening
      4. Workmanship
      5. Finish

<u>Twentieth Week</u> — <u>January 30-February 3</u>

1. Electricity

   a. Desmarais planned and gave all lectures
   b. Through electricity lectures, Baetz planned for plastic unit

2. Discuss

    a. Why study electricity in industrial arts?
    b. Course content

3. Occupations in Electricity Chapter I

    a. Read from text, Exploratory Electricity-Joseph P. Arnold and Kenneth L. Schank, McKnight and McKnight Copyright 1960

4. Assignment

    a. Answer questions 1-16 Chapter I of text

5. Magnetism

    a. What are magnets?
    b. What is a magnetic field?
    c. Experiment #4 of Crowe Demonstration kit Polarity-Live TV

6. Electro-magnet

    a. How electro-magnets are made?
    b. What determines magnetic strength?
    c. Experiments 5-6 (Crowe)

        1. Magnetic field
        2. Making a simple electro-magnet - Live-TV

7. Answer questions on p. 25 (Quest. 1-13) of text
8. Film-commercial "Electro-magnetism"

<u>Twenty-first Week</u> — <u>February 6-10</u>

1. Project Design

    a. Choice between

        1. Buzzer
        2. Jumping Ring

2. Discussion of project

    a. Planning sheet
    b. Selection of materials
    c. Wiring
    d. Making adjustments
    e. Use of transformers

3. Work on project, individual help

Twenty-second Week **February 13-17**

1. Producing electricity demonstration- Live-TV

   a. Wet cell
   b. Dry cell

2. Develop concept of flow of electrons
3. Discuss- How far off is electrical car?
4. What is a volt?
5. Demonstration - Live-TV

   a. Wire splicing
   b. Wire connections

6. Generating alternating current
7. Work on project-Individual help,both instructors
8. Project due-Criteria for grading-joint grading

   a. Size
   b. Wiring
   c. Splices
   d. Workmanship
   e. Performance of project

Twenty-third Week **February 20-24**

1. Discuss electric circuits

   a. Series
   b. Parallel

2. Discuss use of metals
3. Discuss drawing and wiring diagram and symbols
4. Complete wiring diagrams p. 48-56-Diagrams 1-15 Text

Twenty-fourth Week **February 27-March 3**

1. Complete circuit wiring-Individual help,both instructors
2. Diagrams due

Twenty-fifth Week **March 6-10**

1. Show video tape-Eaton-Dynamatic-Practical application

   a. Circuits
   b. Soldering
   c. Wiring

2. Discuss:

a. Electric machines
b. Generators
c. Transformers
d. Project design
e. Discuss project-Small electric motor

3. Work on project-Individual help,both instructors

Twenty-sixth Week — March 13-17

1. Resistance

   a. Gauging wire
   b. Conductors
   c. Insulators

2. Using resistance
3. Practical application of Lenz Law
4. Assignment-Answer questions on page 17 of text (Questions 1-10)

Twenty-seventh Week — March 20-24

1. Electronics film, commercial, RCA
2. Electrical connections
3. Printed circuits
4. Electricity in the home

   a. Safety

5. Soldering demonstration-video tape
6. Work on project- Individual help,both instructors

Twenty-eighth Week — March 27-31

1. Discuss

   a. Watts
   b. Figuring electrical costs

2. Work on project-Individual help,both instructors

Twenty-ninth Week — April 3-7

1. Review for test
2. Electricity Unit Test
3. Review Test results
4. Work on project-Individual help,both instructors

5. Project due

   a. Joint grading criteria

      1. Wiring
      2. Construction
      3. Workmanship
      4. Size
      5. Performance of project

<u>Thirtieth Week</u> <u>April 10-14</u>

1. Plastics - Mr. Baetz gave all lectures and organized course. During lecture on plastic, Mr. Desmarais worked on master copy of records and summary sheets of test results.

2. Discuss course content
3. Hand out sheets and discuss

   a. What is plastic?
   b. Plastic structure
   c. Members of plastic family

4. Project - Design of shakers
5. Discuss project requirements

   a. Size
   b. Shape
   c. Design

5. Demonstration - video tape

   a. Cutting plastic

      1. Band saw
      2. Hand saw
      3. Jig saw

6. Work on project- Individual help, both instructors

<u>Thirty-first Week</u> <u>April 17-21</u>

1. Hand out sheets on Acrylics

   a. Physical properties
   b. Working abilities
   c. Typical application

2. Demonstration - Live TV

    a. Filing Plastics

        1. With file
        2. Disc sander

3. Work on project- Individual help,both instructors

<u>Thirty-second Week</u> <u>April 24-28</u>

1. Plastics demonstration - video tapes

    a. Cementing
    b. Drilling
    c. Buffing

2. Demonstration test covering

    a. Cutting band saw
    b. Cutting jig saw
    c. Cementing
    d. Drilling

3. Work on project- Individual help,both instructors
4. Video tape- Racine Industrial Products

    a. Vacuum forming-related to skills in shop

        1. Shearing
        2. Heating
        3. Forming-vacuum

<u>Thirty-third Week</u> <u>May 1-5</u>

1. Field Trip - Snap-on Tools
2. Work on project-Individual help,both instructors

<u>Thirty-fourth Week</u> <u>May 8-12</u>

1. Work on project-Both instructors giving individual help
2. Show industrial video tape- Vacuum forming (Racine Industrial Products)

<u>Thirty-fifth Week</u> <u>May 15-19</u>

1. Review for test
2. Plastics Unit Test
3. Review test result
4. Work on project-Individual help,both instructors

5. Project due - Joint grading - criteria

    a. Size
    b. Design
    c. Workmanship
    d. Finish

<u>Thirty-sixth Week</u> <u>May 22-26</u>

1. Technical Knowledge Test

    a. Woods
    b. Metals
    c. Electricity

2. Clean out lockers and take projects home
3. California Test of Mechanical Ability

<u>Thirty-seventh Week</u> <u>May 29-June 2</u>

1. California Test of Mechanical Ability
2. California Test of Personality
3. Clean up shop

<u>Thirty-eighth Week</u> <u>June 5-6</u>

1. Review year's achievement
2. Question and answer discussion on year's work
3. Hand out report cards

RESULTS

According to our interpretation of the instructions, this section should describe the degree to which the results reflect the attainment of our objectives. In attempting to write this section, we discovered that the results of some of our objectives could be readily documented through substantiating statistical analysis. Other objectives were harder to measure, such as how effectively we are using teacher time, shop equipment, and school facilities. In order to meaningfully define results, we have divided them into two categories - substantiative and non-substantiative. Part A will deal with the results of statistical analysis of all available data. Part B will consist of observations by each of the investigators.

Part A - Substantiative Results

1. Both groups showed an increase in mechanical ability (as indicated on the California Prognostic Test of Mechanical Ability) although the experimental group showed a slightly better increase of ability which undoubtedly reflects the slight advantage in IQ.

2. In that results on the mechanical ability tests reflect on background experience, the similarity of results is indicative of the fact-both groups had nearly identical programs of study.*

3. The significantly higher increase in mechanical interest (California Picture Interest Inventory-Mechanical Interest Subtest) of the experimental group definitely reflects the impact of television and video tapes. Two-thirds of the control group scored below the 50th percentile on the mechanical interest final test, while better than two-thirds of the experimental group scored at or above the 50th percentile.

4. The similarity of the test results in mechanical ability between the experimental and control groups indicate that despite a slight variance in IQ, both groups started from a common point and were matched in terms of mechanical ability. This tends to validate the other statistical evidence and reflects balanced grouping between the experimental and control groups.

6. Initially, the correlation between mechanical interest and ability was nearly ten times as great for the control group as for the experimental. At the conclusion, the correlation ratio of the control group was only four times greater than the experimental group. This substantiates the significance of the increase in mechanical interest due to television.

7. The results of the California Personality Inventory were disappointing. Either the major portion of both the experimental class and the control group are maladjusted or the test

*See Part (e) of Methodology for Descriptive Schedule of Program of Study.

reliability and validity might be questioned. The median dropped in the Personal Adjustment, Social Adjustment and Total Adjustment scores for the control group, and came up on all three scores for the experimental group. The standard deviation increase of the control group indicates a wider distribution of scores but from a lower base than the experimental group. The decreasing standard deviation of the experimental group indicates a stabilizing effect had been caused by something - (Television impact?)

8. If the personality tests have any validity, the results would suggest that the students in the experimental group have formulated better self concepts and seem to have improved their understanding of their role in society. Optimistically, we would like to think that the program for the experimental group helped to create these results. Our personal knowledge of each of the boys in the study causes us to have real doubts about the accuracy of the evaluations. Because of the questions relating to the value of the test, we cannot be sure of the validity of the conclusions from the Personality Inventories.

9. The traditional bias of the Technical Knowledge Test became very apparent in the results. Both groups indicated increases in all three subtests. On the Woods Test, (This was included because parts of it refer to tools and processes used in Plastics. We could not find a good standardized test for plastics.) the experimental group made slightly higher increases than the control group. This may be due in part to the slightly higher IQ, but, most likely, it is due to the relationship with plastics which the experimental group really mastered.

10. The control group made slightly greater increases on the Metals and Electricity Tests and the Composite scores than did the control group. This reflects the traditional bias of the test as the experimental group achieved higher results over these same areas on unit tests prepared by the instructors. (Incidentally, the control group made higher scores on the unit tests but not as high as the experimental group.) Team teaching with television is a new approach and different objectives were stressed. The Technical Knowledge Test apparently did not measure these objectives.

11. When the Technical Knowledge Test results of the experimental group are compared on an individual basis with those of the control group, proportionally more students received higher grades and lower grades, even though the control group made the greater overall increases.

12. The quality of student projects in the control group was better at the beginning of the year than that of the experimental group. As the year progressed, this position gradually was reversed. The experimental group outgrew the novelty of television, and as we improved our techniques using television, the experimental group improved on unit tests and in the quality of student projects.

13. Because the initial projects of the control group were better than the experimental group, we concluded that they had initially a higher degree of perceptual motor skills. The reversal of positions at the end of the year suggest a greater increase in perceptual motor skills on the part of the experimental group.

14. Experimental group unit test scores over teaching units in which live television or video tapes were used were much higher than unit test results over units which had not involved television.

15. Experimental group unit tests over units in which the traditional approach was used produced results that were equal to or not quite as high as those of the control group using a traditional approach.

16. Experimental group unit tests over units in which televised demonstrations were used, consistently produced higher results than the same tests for the control group.

17. The results of unit tests which evaluated the understanding and appreciation of the various industrial processes and products indicates a higher performance by the experimental group which viewed the video tapes of industry. The control group results indicated a lack of depth in understanding even though they actually visited the factory.

18. The results of scores on unit tests and student projects suggest the need for increased flexibility in teaching processes and skills.

Part B - Non-substantiative Results

Teacher Observations - Robert Baetz

In summarizing this year's progress in working on our federal research project, there are several general conclusions I have formed.

1. Video taped demonstrations demanded more time in preparing and actual taping than did the preparation and presenting of a traditional demonstration; however, I feel the end result heavily outweighs the extra time spent. In that we can use these tapes for several years to come, the long term gain will more than equal time spent in the preparation and production of the tapes.

2. Using taped demonstrations, the instructor had the advantage of watching himself and often found certain points were not clear because of the way in which they were presented. Sometimes areas that you wanted to emphasize were left out. When an instructor presents a live demonstration, he may think he is meeting his requirements, but there is actually no way to be certain. This, to me, was one of the most personal gains a teacher could find - professional self improvement. As an example, I found myself using the word "and" too often. Without seeing and hearing this habit, I would not have been aware of the problem so I could correct myself.

3. With video tape I felt it gave me more time for individual instruction. For example, the demonstration seemed to be much more understandable. Thus, I spent less time repeating demonstrations throughout the project. This freed me to give more individual assistance to students. As a result, I was able to make more effective use of my time.

   Pretaped demonstrations solved the problem of having critical machines tied up while a demonstration is being set up or taken down.

Many times during a project, several key machines are used heavily, and if the instructor is setting up the demonstration for the next class or cleaning up after the demonstration, the use of this machine is delayed. With the pretaped demonstration, you avoid this problem and obtain better use of the physical facilities.

4. One of the unexpected values that came to my attention was that students in the experimental group more often came in after school to work on their project or to discuss a lesson than did the control group. This, to me, indicated television was a motivating tool which helped create interest.

Earlier in this report it was mentioned that we also used television in a team unit shop. A survey of the unit shop students who used television found that 98% of the students felt strongly about the following:

a. Video taped demonstrations were easier to see than the traditional method.

b. Video taped demonstrations were more easily understood because the students felt the demonstrations were more thoroughly presented.

c. Closeup and magnification of areas that could not be obtained in live methods helped students to better understand the lesson.

I found by having the students sitting at their desks, they seemed to be in a more receptive mood. This cut down the discipline factor because the need to congregate for the demonstration was no longer present. Because they had a writing area during the taped demonstration, the students took notes about the lesson. During the traditional demonstration method, this was not possible. I feel this in itself is a tremendous advantage we observed through the use of television.

5. The relationship we developed with industry was highly successful. Because we could tape various processes that we want, we have found field trips in the future can be minimized. Field trips are a headache to industry. Safety is a problem. Students, as typical human beings, are unpredictable. For this reason, industries are reluctant to take classes through their plant. With television we could tape the process, thus eliminating safety problems and the need for factory personnel to guide a tour.

6. The tapes were especially effective for working with absentees. Traditionally, makeup demonstrations for one or two students are added to a full day of learning. This is not a good learning situation. First, the instructor is not as effective, and second, the students in most cases resent staying after school. With the video tape, the demonstration can be shown during class time with a perfected demonstration.

I was generally quite pleased with the television tapes which we made; however, we have just scratched the surface in this area. With our experience and background, we now have a good foundation to do a more effective and complete job of research.

Robert Baetz

Teacher Observations - Robert Desmarais

Today's students, particularly at the junior high level need a good industrial arts program. Facing a technically orientated society necessitates that they have a better understanding of industry and its effect on their way of life. They need to develop a technical background which will enable them to cope with the machines, tools and technology that are common to their environment. They need to discover their own skills and aptitudes as early as possible to take advantage of new avenues of training available. They need, more than ever before, to develop an appreciation of the world of work and an awareness of the opportunities that it presents for a more satisfying life.

Today's industrial arts instructor is faced with a paradox of trying to develop both depth and breadth in an industrial arts program. To have a program that reflects industry in a realistic way and still meet and fulfill individual needs, is not an easy task. Perhaps massive changes in the whole program of industrial arts will have to take place. Until this happens, however, the industrial art teacher must continue to use all the motivating factors inherent in industrial arts subjects, use all the resources around him, try new techniques, and innovate to bring students to technical literacy.

The innovations in teaching industrial arts developed in this research project are ways in which the gap between industry and industrial arts can be narrowed. The use of television and team teaching techniques are educational tools that can reach out and bring local industrial techniques into the classroom. Moreover, if these industrial techniques relate to what is going on in the classroom, they make classroom activities that much more meaningful. In fact, making industrial arts education relevant to what is going on in the industrial world and to the student's individual needs, would be achieving a long time objective of industrial arts.

In addition to bringing in operations from local industry, the use of live and video tape productions can serve to significantly improve classroom instruction. This research project and other findings in the use of television points out the advantages over fact to face instruction. These advantages, plus the comprehensive analysis of what to present, how to present it and constant re-evaluation of video taped lessons by being able to review your work, is a significant help in the constant battle to improve instruction.

Through this research we have clearly identified the need for continual study, research, and organization of material which should be included in industrial arts programs. Our experience indicates that we are working in the right direction; however, we recognize that we could not solve all the problems in developing a program that completely and realistically reflects today's technology. We do feel that these methods are worthy of continued study and refinement, and will assist in improving the technical literacy of the American public.

Robert Desmarais

DISCUSSION

Close examination of the results of our evaluative instruments suggests that in all cases the instrument used did not measure the objectives we were attempting to evaluate. This is particularly true of the California art teacher must continue to use all the motivating factors inherent in industrial arts subjects, use all the resources around him, try new techniques, and innovate to bring students to technical literacy.

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Robert Desmarais

DISCUSSION

Close examination of the results of our evaluative instruments suggests that in all cases the instrument used did not measure the objectives we were attempting to evaluate. This is particularly true of the California

Personality Inventory. It was our desire to measure the self concept of each individual as he saw himself relating to society. We had planned to make a measurement at the beginning of the project and also at the end so that the increase or decrease might then suggest improvement or deterioration. We had some questions about the results of the initial administration of this test which we indicated in our February quarterly progress report. While the final results do suggest an increase in personal and social stability on the part of the experimental group, the overall low scores of both groups cause us to question the reliability of our belief that this test measured what we desired.

As described in Results Part B, there were other indicators of improved self concept and understandings of societal relationships. The better discipline which developed in the experimental group reflects a more mature attitude toward the importance of education in planning for a vocation. The experimental group tended to ask more penetrating questions. The control group in visiting a factory asked rather simple questions and failed to see the relationships between industrial arts skills and the technology of industries.*

We were also concerned about the results of the Technical Knowledge Test. At first glance, it appears that the control group made a greater increase in technical than the experimental group. Statistically, this is true even though a higher percentage of the experimental group had higher scores than the control group. A closer evaluation of the test itself revealed that the technical knowledge measured pertained to the more traditional objectives of industrial arts. These relate to the skills and processes involved in the "bread board and sugar scoop" type of program. Our objectives related to an improved understanding of industrial technology as it relates to the skills and processes in industrial arts education. In addition, we found that the sections of the Woods test did not really evaluate technical knowledge in the area of Plastics. What was included regarding plastics was competantly answered by our experimental group.

We are confident that both groups experienced an increase in technical knowledge because of the scores on the unit tests and other written assignments. It is apparent that these teacher-made tests more accurately assessed our objectives in the area of technical knowledge. Because the experimental group was exposed to live television demon-

*See the results of the Occupational Study Test in item 7 of Appendix B.

strations, video taped demonstrations and tapes of industrial processes, as well as the traditional teacher "face to face" demonstrations, we had an excellent opportunity to compare results of each. (The control group had only the traditional demonstrations.) The most effective teacher demonstrations were those which we video-taped. The live television demonstrations, however, produced better results than the traditional demonstration. Apparently, the magnification of details and the focus of attention makes learning more effective. The joint planning and evaluation of video tapes compelled the instructors to organize more effectively and to make better use of supplementary materials. The results on unit tests measuring comprehension and understanding of industrial processes and products definitely indicate the superiority of a well planned video tape over a well planned factory visit. The experimental group definitely gained a better understanding of the relationships between industrial processes and lessons being learned in school. A comparison of Unit Test Results in Appendix A with the Instructional Schedule for the Year, (Methodology-Part (f), confirms the above observations.

The results of the Mechanical Interest subtest of the California Picture Interest Inventory were especially gratifying. The increase in mechanical interest by the experimental group reflects a direct effect of the television and video tapes. The similarity of scores on the California Prognostic Test of Mechanical Ability between the experimental and control groups represents tangible evidence that the program of studies was comparable for both groups. It also confirms the validity of the grouping even though changed slightly from the original arrangements. Our observations lead us to believe that both groups are pretty well matched in terms of intelligence despite IQ test results. The pictorial graphs used in the process of determining the correlation of mechanical ability and mechanical interest revealed the increase in interest on the part of the control group while maintaining or improving mechanical ability.

Team teaching was new to us and so was the use of television. As the year progressed, we improved our team techniques and learned to cope with the technical problems of television. The improvement in the quality of student projects in the experimental group reflects the improvement in our teaching and the use of television. It took us awhile to learn to be more effective, and it took the students some time to get adjusted to a different approach. The control group continued to receive the same type of instructions to which they were accustomed the previous year. They really started out quite well with their projects. With the experimental group, we not only had to improve our techniques, we had to face operational technical problems which often delayed the use of our television equipment during the first semester.

The last quarter of the year, the experimental group experienced intensive exposure to television and video tapes during the unit on plastics. Their superior performance on tests and student projects certainly indicates the effect.

CONCLUSIONS AND RECOMMENDATIONS

At this point we are convinced that we have utilized a new approach to industrial arts education which might have merit for others. The results on tests indicate improved mechanical interest and the capability of improving perceptual motor skills. We believe this approach does make the student more understanding and respectful of the skills needed in industry. Even more important, we believe that we have made our students more fully aware of the importance of continuing education in finding vocational success. In understanding the role of individuals in the industrial process, our students have begun to see themselves functioning in our society. In industrial cities such as Kenosha, this is important.

Test data comparing the understanding and appreciation for industrial processes and procedures indicate that students viewing the video tapes of industry actually gained more than those visiting the factories. They asked better questions and remembered more, and there was not the problem of safety to consider.

The information gained through our extensive testing has helped us to assist each student in gaining a better understanding of his individual strengths, weaknesses, and interests. In working with the counselors, our instructors have substantially assisted students with vocational planning. While we realize students may change their vocational plans several times before they become adults, and probably afterwards, we consider it imperative that young adolescents begin at least to think intelligently about planning for a career.

Our instructors have indicated that they have each become more effective as a result of working in a team. Each teacher has been able to utilize the areas of his greatest strength and they have truly reinforced each other. Joint planning and evaluation has made the teaching team more effective. Because of their experience in a teacher team and also through participation in a research project, this improvement has extended to their functioning in the unit shops as well. Television has enabled them to make more effective use of shop equipment and of their time. They have been able to spend more time with each individual student.

It would appear that team teaching in an industrial arts situation utilizing television does offer some solutions for our objectives and for those of other industrial arts instructors. We have,however, some reservations. We are concerned about the possibility of the "Hawthorne Effect". Although this is the second year we have used television in our building, it is still pretty new. Despite the conclusive results of some of our data, we still wonder if the novelty of television and of team teaching might be responsible.

We are also concerned about the fact that we have used the traditional curriculum in a new setting. As the year progressed, we began to realize that in team teaching, a more flexible curriculum could and should be used. In planning for next year, we hope to incorporate a more flexible approach to projects and to utilize a wider variety of educational experiences.

For a number of reasons, the research project really did not begin early enough. We did not administer the standardized tests until December because they had to be "approved". (This is certainly justifiable in that the tests we used represented a change from those originally proposed.) Some of our television supplies and materials arrived late because orders could not be placed until funds were on hand. It took some time to learn to use the video tape recorder and to develop effective educational techniques for television. We also faced technical problems with the functioning of our electronic equipment which caused delays.

Although our results suggest that we have found some success, we do not feel that we have developed the full potential of this approach. The concern over the possibility of a "Hawthorne Effect", and the desire to try again using improved techniques compel us to recommend that the project be renewed for a second year. We now have the technical "know how" and a backlog of materials and experience on which to build a more realistic research approach. It is currently our plan to apply for a second grant to enable us to continue the project.

During the past year we presented a program to the Southeastern Wisconsin industrial arts teachers describing our project. Many schools have written for information and suggestions about how they could apply various aspects of our approach to their situations. In answering these requests, we have made the following observations:

1. If team teaching is to be effective, the teachers MUST be compatible, enthusiastic, and flexible.

2. In acquiring television equipment, it is best to start with a minimum investment. Television equipment must produce and receive signals which are synchronized and in balance.

3. Purchase equipment from a dealer capable of extending prompt and thorough service. When equipment fails, the program is held back.

4. The use of television could link two or more unit shops so that a team approach could be used for demonstrations and other presentations.

5. Careful planning in the use of television equipment and materials is necessary. It is well to utilize the audio-visual coordinator, the librarian, the counselors, and other staff members teaching related units (i.e., the "World of Work" unit in social studies.)

6. It is necessary to have the understanding and support of school administration if such a project is to succeed.

As we view the future, we contemplate the possibility of expanding our "team" to include other members of the Industrial Arts Department. Each could make significant contributions. Increased correlation between industrial arts areas could be achieved. We anticipate working more closely with the Guidance Department in terms of combating the dropout rate in senior high school. We would like to utilize more members of the industrial community to participate in the production of demonstration video tapes. We would like to work more closely with the high schools and technical institutes in developing meaningful vocationally oriented educational programs. Finally, to assist us in developing the plans to be incorporated in the proposal for renewing our project, we have formed an Advisory Council consisting of local leaders in education, business, industry, trades and labor, and the research staff. We will review with them the procedures and results used in this project. Together, we can identify that which is good and make the most appropriate recommendations for improvements.

Nearly all who have observed our program in action have become enthusiastic supporters. Local industries and service clubs have given cooperation and approval. We believe our approach is educationally sound and that it might be a better way to reach industrial arts students.

SUMMARY

The basic purpose of this project has been to determine whether the use of television in a team teaching situation in industrial arts can:

1. Make team teaching more effective.
2. Increase the knowledge and appreciation of the industrial process and products in our American economy.
3. Make more effective use of the physical plant including equipment.
4. Improve the student's perceptual-motor skills in industrial areas.
5. Update teacher knowledge regarding new industrial technologies.
6. Provide an effective substitute for field trips.
7. Promote increased understanding and cooperation between industry and industrial arts education.

Students from an industrial community were placed in two large groups which were balanced in terms of intelligence and previous industrial arts achievement and experience. Two teachers worked as a team with each of these classes which numerically represented four traditional classes but were combined into two classes for the purposes of this project. Both groups were exposed to identical course offerings with the same two teachers using the team approach. The experimental group was exposed to live television demonstrations, video-taped demonstrations, video tapes of industrial processes and products, and traditional teacher demonstrati ns. The control group was exposed only to traditional teacher demonstrations and field trips so the key variables were the use of television and the video tape recordings.

Evaluation was accomplished by use of: The California Prognostic Test of Mechanical Ability; the California Picture Interest Inventory-Mechanical subtest; the California Personality Inventory-Personal, Social and Total Adjustment subtests; a Technical Knowledge Test covering Woods, Metals, and Electricity; teacher-made unit tests; panel evaluations of student projects; and teacher commentary regarding use of time, equipment and effectiveness of approach.

At the conclusion of the project, the experimental group showed significant increases over the control group in mechanical interest as indicated by the scores on the Picture Interest Inventory. The mechanical ability of both groups increased at about the same rate reflecting exposure to similar courses of study. There was some question regarding the results of the Personality Inventories although indications on these tests, confirmed by performance on unit tests, suggest that the students in the experimental group formed a more stable self image and developed a better understanding of their role in society. The control group showed greater increase on the Technical Knowledge Test although it appears this test might be somewhat more oriented to a traditional approach. Video-taped demonstrations appeared to do a better job than live television; however, demonstrations involving live television were more effective than the traditional teacher demonstrations! The experimental group unit test scores reflected greater depth in knowledge and understanding of industrial processes as a result of viewing video tapes of local industry than did the control group which experienced field trips. Exposure to television gradually increased the perceptual motor skills of the experimental group as measured by the quality of student projects. The perceptual motor skills of the control group tended to remain constant.

Teacher evaluations indicated more effective use of equipment, increased ease of repeating demonstrations, more time available for individual help, improved teaching and evaluation procedures resulting from the use of television and the video tape recorder.

It was concluded that the use of closed circuit television and the video tape recorder made a significant positive contribution toward the attainment of the objectives of the research project. It was recommended that the project be extended a second year to preclude a possible "Hawthorne Effect" and to allow for improved refinements of techniques.

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GLOSSARY (A Layman's Definitions)

Audio: This refers to sound; specifically, the electrical currents representing a sound program or the sound portions of a television program.

Audio-visual Mixer: This is the device used to convert audio and video input signals into an RF output.

Camera: In television, this is a unit which contains lens and a light-sensitive pickup tube that converts a visual image into electrical impulses when properly scanned.

Closed Circuit Television: This is a system of distributing television programs over a cable for specialized audience viewing. The signal cannot be received unless the TV receiver is attached to the distribution cable.

Co-axial Cable: A single transmission line which contains two conductors insulated from each other by suitable material.

Commercial Television: The type of program received in home television sets. This is sometimes fed into a closed circuit system for school use.

Educational Television: Programs produced at very high broadcast frequencies (although ~~sometimes at~~ commercial frequencies) from educational institutions for use in educational programs in homes or schools.

Frequency: The number of cycles in a signal per second.

Interlace: The process of scanning alternate lines of a television picture to reduce flicker. Locked interlace refers to a scanning system where the sweep frequencies used are rapidly tuned and controlled to produce a very stable picture. Random interlace refers to a scanning system based on the 2:1 interlaced broadcast standards which utilizes less precise timing of the sweep frequencies. A camera with random interlace is usually less expensive than one with fixed interlace. If two or more cameras with random interlace are used in the same system, an expensive external sync-generator must be purchased.

Monitor: This is a type of receiver which receives only the video signal. In our system, we use a monitor with each camera to show the camera operator what the camera is seeing.

Modulator: An electronic device which converts the video signals from the cameras to R.F. signals which can be received by normal television sets.

Picture Density: This is an indication of the closeness or frequency of scan lines per inch on a television tube. The higher the number of lines per inch, the better the quality of the camera, receiver, or monitor. High picture density enables clear transmission of fine details and is essential to close up work where details must be seen.

R.F. This is an abbreviation for radio frequency. The present practical limits of radio frequency are roughly 10 k.c. per second to 100,000 m.c. per second.

Resolution: This refers to the blending of picture elements and lines. The number of lines represented by the vertical wedges at their point of blending is the resolution in lines. As indicated previously, the greater the number of lines, the better the picture density and the higher the amount of detail which can be seen.

Scanning: This is the process of deflecting the electron beam in a camera or picture tube so that it moves at high speed from left to right in a sequence of rows or lines from top to bottom. The intensity of the light or shadow is converted to varying degrees of electrical impulse strength in the camera and is reconverted to corresponding light or dark areas in the picture tube image.

Switcher: A mechanical device for switching the signal between two or more input sources into a single output cable.

Video: This refers to sigh or specifically the electrical impulses which carry only the picture image.

Video Tape Recorder: A device which will record and play back both audio and video signals.

Vidicon Tube: The electronic device in a camera which automatically compensates for changes in the intensity of light and darkness.

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APPENDIX (a)

STATISTICAL SUMMARY
STANDARDIZED TEST RESULTS

	Initial Testing										Final Testing									
	Experimental Group					Control Group					Experimental Group					Control Group				
	Stand.Dev.	Median	Mean	Mode	Range	Stand.Dev.	Median	Mean	Mode	Range	Stand.Dev.	Median	Mean	Mode	Range	Stand.Dev.	Median	Mean	Mode	Range
*Calif.Pict. Int.Inv.Mech.	29.9	50	50.7	70-74	5-95	37.1	40	63.5	46-60	1-98	28.05	50	54.8	60-69	5-95	28.3	40	37.5	5-20	5-94
*Calif. Prognostic Test of Mech.Ability	29.35	80	76.7	80-84	30-95	22.1	60	78.1	80-84	20-95	15.05	80	70.8	80-94	30-99	21.5	70	68.64	70-79	20-95
Calif.Personality Test																				
Personal Adjust.	27	20	30	2-10	1-99	19.55	30	26.43	1-10	1-60	28.45	30	35.4	2-10	2-90	22.6	20	24.23	15-20	2-80
Social Adjust.	21.3	20	26.58	1-10	1-99	18.25	10	18.24	1-10	1-70	29	30	31.54	2-10	2-90	20.65	10	16.82	2-10	2-60
Total Adjust.	26.8	20	27.26	1-10	1-90	16.75	20	18.38	1-10	1-60	23.2	30	33.5	2-10	2-90	20.15	10	20.09	5-10	2-60
Technical Knowledge Test																				
Woods	10.02	40	41.56	36-40	30-60	11.58	45	41.74	46-50	20-65	8.16	45	43.68	46-48	28-64	9.03	40	39.82	36-40	26-57
Metals	12.03	35	33.15	41-45	10-55	10.63	35	33.3	41-45	15-45	13.38	40	43.12	40-42	10-76	9.42	39	39.18	34-42	22-58
Electricity	13.03	40	35.6	40-45	1-70	10.52	30	29.63	21-30	10-55	18.09	46	50.48	38-46	10-88	16.56	50	43.7	24-32	12-74
Composite	8.22	35	35.18	36-40	15-45	8.38	35	31.	26-30	20-45	11.55	44	45.6	39-47	22-71	12.96	46	40.6	50-55	23-55

* The correlation ratio between Mechanical Ability and Interest was initially 5.9 for the Experimental Group and 53.52 for the Control Group. At the conclusion of the project, it was .61 for the Experimental and 2.42 for the Control.

APPENDIX (b)

STATISTICAL SUMMARY

UNIT TEST RESULTS

	Experimental Group					Control Group				
	Standard Deviation	Median	Mean	Mode	Range	Standard Deviation	Median	Mean	Mode	Range
1. Sheet Metal Demo. T-V	9.45	95	89.61	95	65-95	12.3	90	84.23	95	65-95
2. Sheet Metal Test	9.8	75	79.23	75-80	65-95	9.11	75	72.88	65-70	65-95
3. Planter Box Test	11.49	75	84.23	65-70	65-95	11.26	75	74.81	65-70	65-95
4. Bench Metal Test	9.3	80	83.85	80-85	65-95	6.7	80	82.5	80-85	65-95
5. Bench Metal Layout	11.05	80	75.19	65-70	65-95	10.1	80	81	65-70	65-95
6. Uses of Electricity T-V	11.45	90	84.42	95	65-95	12.3	75	77.95	65	65-90
7. Occupational Study	9.3	90	82.11	90-94	65-95	10.9	85	80.23	85-90	65-95
8. Wiring Problems	7.75	90	90.19	95	65-95	10.3	90	92.95	95	65-95
9. Electricity Exam	10.15	85	83.85	90-94	65-95	9.35	75	80.68	75-80	65-95
10. Plastic Demo. Test T-V	11.25	90	82.88	95	65-95	9.5	75	75	65-70	65-90
11. Plastic Test	8.65	90	88.65	95	75-95	9.5	80	80.91	80-84	65-95

APPENDIX (c)

STATISTICAL SUMMARY
PROJECT EVALUATION ANALYSIS

	Experimental Group					Control Group				
	Standard Deviation	Median	Mean	Mode	Range	Standard Deviation	Median	Mean	Mode	Range
1. Metal Guage	9.63	80	79.42	80-84	65-95	12.3	90	84.23	95	65-9
2. Planter Box	9.04	80	81.54	75-79	65-95	7.46	80	80.38	75-79	65-9
3. House No. Holder or Candle Holder	8.79	80	82.11	80-84	65-95	9.1	80	92.8	80-84	65-9
4. Electrical Projects (Buzzer or Jumping Ring)	8.6	85	85.6	85-90	65-95	14.2	90	88.18	90	75-9
5. Plastics Projects	8.05	90	85	80-84	65-95	8.2	75	77.27	75-79	65-9

INTELLIGENCE TEST DATA
Otis:Beta Form EM

Experimental Group					Control Group				
Standard Deviation	Median	Mean	Mode	Range	Standard Deviation	Median	Mean	Mode	Range
7.86	108	96.1	109-112	92-128	8.85	100	102.2	98-101	70-12

APPENDIX (d)

STATISTICAL FORMULAE USED

For this project, the following statistical data was utilized: Standard Deviation, Median, Mean, Mode, Range, Co-efficient of Correlation. Listed below are the formulae used or appropriate definitions.

(1) Standard Deviation

$$S.D. = i\sqrt{\frac{\Sigma f(x')^2}{N} - \left(\frac{\Sigma fx'}{N}\right)^2}$$

i = interval
f = frequency of score
x' = assigned value
N = number of units in distribution
Σ = the sum of

(2) Median - The score or ranking which represents the point at which one-half of the distribution rank above and one-half ranks below.

(3) Mean - The sum of all of the scores in a distribution divided by the number of scores. The average

(4) Mode - The score which appears most frequently in a distribution.

(5) Range - The highest and lowest scores in a distribution.

(6) Co-efficient of Correlation or Correlation Ratio (r = ratio)

$$r = \frac{\frac{\Sigma fx'y'}{N} - \left(\frac{\Sigma fx'}{N}\right)\left(\frac{\Sigma fy'}{N}\right)}{\sqrt{\frac{\Sigma f(x')^2}{N} - \left(\frac{\Sigma fx'}{N}\right)^2} \cdot \sqrt{\frac{\Sigma f(y')^2}{N} - \left(\frac{\Sigma fy'}{N}\right)^2}}$$

f = frequency
x' = assigned values-group A
y' = assigned values-group B
N = Number of units in each sample
Σ = the sum of

APPENDIX (e)

STATISTICAL SUMMARY
DATA SOURCES
EXPERIMENTAL GROUP

Student Number	IQ (Otis Beta)	Technical Knowledge Test: Initial — Woods	Initial — Metals	Initial — Electricity	Initial — Composite	Final — Woods	Final — Metals	Final — Electricity	Final — Composite	Mechanical Interest-Initial	Mechanical Interest-Final	Mechanical Ability-Initial	Mechanical Ability-Final	Personality Inventory: Initial — Personal Adjustment	Initial — Social Adjustment	Initial — Total Adjustment	Final — Personal Adjustment	Final — Social Adjustment	Final — Total Adjustment
1	113	33	24	54	37	46	38	40	41.1	20	50	80	70	50	40	50	60	60	60
2	128	40	24	30	31.1	42	44	38	41.1	40	60	60	90	60	20	30	50	10	20
3	109	31	42	36	36.1	48	24	26	32.2	95	40	95		30	5	20	2	5	2
4	112	46	40	36	40.2	64	46	64	58	20	30		90	5	20	10	30	50	40
5	104	42	18	56	38.2	33	42	48	41	5	50	70	90	10	5	5	10	20	20
6	101	40	52	48	46.2	37	58	56	50.1	20	30	90	80	60	50	50	40	40	40
7	116	48	50	44	47.1	46	66	70	60.2	90	90		99	10	30	20	30	30	30
8	106	55	28	22	35	51	50	38	46.1	70	60	90	90	10	5	5	10	5	10
9	96	42	16	44	34	28	38	38	34.2	80	20	30	50	2	2	2	5	5	5
10	94	42	44	20	35.1	51	40	40	43.2	70	50		60	2	10	5	2	5	5
11	92	31	48	68	49	37	28	44	36.1	90	99	50	90	1	2	2	2	10	5
12	84	35	36	34	35	37	36	48	40.1	5	60	90	80	98	95	95	90	90	90
13	111	26	24	36	28.2	31	24	44	33	10	5	80	80	1	2	1	1	10	1
14	100	46	42	46	44.2	46	64	88	66	50	10		30	5	2	2	2	5	5
15	125	57	40	30	42.1	53	60	72	61.2	70	60	90	90	50	40	50	60	50	60
16	93	44	24	26	31.1	40	40	30	38.2	70	40	50	90	1	5	2	1	2	1
17	124	51	46	44	47	55	74	86	71.2	30	60	90	95	40	50	50	60	40	50
18	109	46	28	40	38	48	38	44	43.1	50	60	90	40	70	90	80	80	90	90
19	104	51	40	42	44.1	35	42	58	45	80	90		95	5	10	5	20	20	20
20	117	31	40	36	35.2	44	44	54	47.1	20	40	90	90	60	30	40	60	40	50
21	102	31	14	20	21.2	48	10	26	28	80	90	70	80	10	5	10	20	10	20
22	112	24	20	20	21.1	35	30	16	27	50	90	80	70	20	1	2	30		1
23	110	53	40	46	46.1	51	42	76	56.1	90	90	80	90	50	60	50	70	50	60
24	99	37	32	42	37	42	40	46	42.2	70	5	80	80	60	70	70	60	70	70
25	105	51	44	46	47	46	40	62	49.1	10	50	80	90	20	10	20			
26	106	44	26	2	51	44	60	72	58.2	90	95		50	50	30	40	60	40	50

STATISTICAL SUMMARY

DATA SOURCES

EXPERIMENTAL GROUP

	Unit Tests											Projects				
Student Number	Sheet Metal Demo. Test	Sheet Metal Test	Planter Box Test	Bench Metal Test	Bench Metal Layout	Uses of Electricity	Occupational Study	Wiring Problems	Electricity Exam	Plastics Demo. Test	Plastics Exam	Metal Gauge	Planter Box	House Number or Candle Holder	Electrical Projects	Plastics Projects
1	95	80	65	80	80	90	90	95	75	95	90	80	90	80	95	75
2	65	75	75	75	65	65	65	75	65	75	90	75	75	80	85	80
3	95	80	90	80	90	95	75	95	85	95	90	80	95	95	95	95
4	90	80	95	90	65	65	90	90	95	90	95	90	75	75	85	80
5	95	65	90	65	65	85	65	75	75	75	80	90	75	75	75	80
6	95	95	75	80	90	85	90	95	90	95	95	95	95	95	95	95
7	95	90	90	80	95	95	95	90	90	65	95	80	80	80	90	90
8	95	80	90	65	65	95	65	75	75	80		65	75	80	75	90
9	95	75	65	65	65	85	90	85	65	65	90	75	65	65	85	65
10	80	65	80	90	65	65	75	75	90	95	75	80	95	75	75	95
11	95	95	75	90	80	65	95	75	75	90	80	75	90	80	75	90
12	95	75	65	75	65	95	90	75	75	65	80	95	75	90	75	80
13	95	75	80	75	80	85	90	95	90	75	80	95	75	75	90	75
14	90	80	95	95	80	80	75	90	95	95	95	75	75	75	90	75
15	95	90	90	95	90	95	90	95	90	95	95	65	95	90	95	95
16	95	65	65	90	65	95	90	85	65	90	80	95	75	80	75	95
17	95	90	80	80	80	95	90	95	95	95	95	80	80	75	95	80
18	80	75	65	95	65	90	65	85	65	75	90	90	90	95	85	90
19	95	65	65	80	65	95	75	85	70	95	95	95	75	90	85	80
20	95	95	75	90	90	85	90	95	90	95	80	80	80	95	95	90
21	75	75	65	65	65	85	65	85	65	80	95	80	80	80	85	80
22	95	80	65	90	65	65	85	65	75	75	90	80	80	90	65	90
23	95	80	95	80	95	65	65	90	85	90	75	90	95	[illegible]	95	80
24	95	75	65	80	80	95	90	95	85	95	95	90	80	95	95	90
25	75	95	75	80	65	85	90	95	90	95	95	90	80	80	95	95
26						85	85	90	95	95	90				85	80

STATISTICAL SUMMARY

DATA SOURCES

CONTROL GROUP

		Technical Knowledge Test													Personality Inventory					
		Initial				Final									Initial			Final		
Student Number	IQ (Otis Beta)	Woods	Metals	Electricity	Composite	Woods	Metals	Electricity	Composite	Mechanical Interest-Initial	Mechanical Interest-Final	Mechanical Ability-Initial	Mechanical Ability-Final		Personal Adjustment	Social Adjustment	Total Adjustment	Personal Adjustment	Social Adjustment	Total Adjustment
1	110	42	44	26	37.1	40	58	48	48.2	95	30	95	80		30	30	30	50	60	60
2	101	26	38	22	28.2	35	38	54	42.1	20	30	70	80		40	5	20	60	10	30
3	107	48	40	32	40	37	56	56	48	30	50	80	70		40	30	40	2	5	5
4	100	42	52	26	40	44	30	38	37.1	30	20	60	70		50	20	30	20	10	10
5	99	28	30	32	45	55	46	50	50.1	80	98	95	80		30	2	10	50	20	40
6	93	24	26	26	25.1	35	30	30	31.2	5	20	80	70		10	5	5	2	2	2
7	89	28	24	28	26.2	26	32	12	23.1	10	20	30	20		20	20	20	5	2	5
8	96	24	22	22	22.2	31	36	44	37	60	10	50	50		30	30	30	20	10	20
9	110	37	32	28	32.1	40	40	32	37.1	1	10	60	80		5	10	10	2	10	5
10	89	26	24	18	[illegible]	40	22	30	30.2	95	50	60	50		2	10	5	20	30	30
11	94	26	38	20	28	31	34	22	29	40	5	20	40		10	10	10	20	5	10
12	119	44	42	58	48	37	56	74	55.2	60	40	90	99		40	30	40	40	20	30
13	106	42	42	28	37.1	42	42	74	52.2	98	80	80	99		10	20	10	10	5	10
14	70	31	24	14	23	28	32	19	26.1	70	40	30	20		5	5	5	10	2	5
15	104	22	44	26	30.2	28	34	26	29.1	98	70	20	70		5	1	2	20	2	5
16	99	42	30	32	34.2	53	50	50	51	10	5	70	70		30	10	20	5	2	5
17	81	37	22	38	32.1	31	22	30	27.2	2	5	30	60					2	20	5
18	85	64	16	38	39.1	44	42	62	49.1	90	98	80	90		60	5	20	20	10	10
19	91	42	48	46	45.1	57	50	58	55	50	50	70	60		5	10	5	5	5	5
20	114	47	56	42	48	48	38	68	51.1	40	60		95		40	60	50	60	60	60
21	101	44	32	44	40	48	44	58	50	80	30	80	95		60	20	40	80	20	40
22	92	28	18	20	22	46	30	26	34	10	10	40	70		40	70	60	30	60	50

STATISTICAL SUMMARY

DATA SOURCES

CONTROL GROUP

Student Number	Unit Tests: Sheet Metal Demo. Test	Sheet Metal Test	Planter Box Test	Bench Metal Test	Bench Metal Layout	Uses of Electricity	Occupational Study	Wiring Problems	Electricity Exam	Plastics Demo. Test	Plastics Exam	Projects: Metal Gauge	Planter Box	House Number or Candle Holder	Electrical Projects	Plastics Projects
1	95	80	90	80	80	65	90	95	85	90	90	95	85	95	95	65
2	80	65	80	90	90	65	90	90	75	80	80	65	75	80	90	90
3	90	90	65	80	95	90	85	95	75	65	90	90	80	80	90	65
4	95	75	65	90	80	90	90	95	75	80	90	90	95	90	90	80
5	95	80	95	90	65	90	65	75	90	90	90	90	95	95	90	75
6	75	75	90	75	75	90	65	75	75	75	90	95	75	65	85	75
7	65	90	65	90	65	85	65	75	65	65	75	75	75	80	85	75
8	90	65	80	80	80	85	75	75	90	80	80	95	90	80	85	75
9	95	65	80	75	65	65	90	85	75	65	65	65	80	80	90	75
10	90	65	65	80	80	65	85	95	75	65	80	75	80	80	90	90
11	65	65	65	75	65	65	85	65	65	65	80	75	75	80	85	75
12	95	90	95	80	95	65	95	95	95	65	95	75	80	75	85	75
13	95	80	95	90	65	90	65	95	90	75	90	95	75	75	95	90
14	80	65	65	65	65	65	85	85	75	65	65	65	65	90	90	75
15	65	65	65	80	65	65	85	65	65	75	65	95	75	80	75	65
16	95	75	75	90	80	65	65	90	75	65	80	80	80	95	90	75
17	65	65	75	75	80	95	85	90	75	80	80	65	75	80	90	80
18	95	65	65	80	65	95	90	75	85	90	95	95	95	95	90	90
19	65	75	75	80	80	75	65	95	90	90	80	90	80	75	90	65
20	95	85	80	90	80	85	90	95	95	80	65	80	90	80	90	90
21	95	90	80	95	95	75	65	95	90	80	80	80	90	75	85	80
22	65	65	65	90	90	85	90	95	85	65	75	80	90	75	85	80

INDUSTRIAL ARTS ACHIEVEMENT TEST

WASHINGTON JUNIOR HIGH SCHOOL

KENOSHA, WISCONSIN

Name of Student_______________________

Class_______________Period________

Date________________Grade________

WOODWORK

DIRECTIONS: Each of the questions below is followed by several choices. Select the best answer and put its number in the blank.

_____1. The term 'softwood' indicates (1) the wood is softextured. (2) the wood is hand textured, (3) the wood comes from a tree that does not shed leaves, (4) the wood comes from a tree that has leaves in the summer.

_____2. A tree which is a hardwood is (1) Douglas fir, (2) white pine, (3) red cedar, (4) coast maple.

_____3. The handsaw which should be used to saw with the grain is (1) back, (2) rip, (3) crosscut, (4) coping.

_____4. Ripsaw teeth are shaped like (1) cones, (2) knives, (3) axels; (4) chisels.

_____5. The cutting points of crosscut teeth are shaped like (1) chisels, (2) knives, (3) axes, (4) needles.

_____6. The purpose of a plane iron is to (1) prevent chatter, (2) curl the shaving, (3) cut the shaving, (4) hold the double plane iron in place.

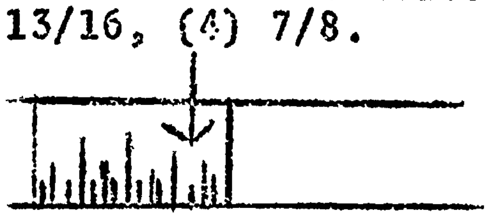
_____7. The purpose of the plane iron cup is to (1) stiffen, (2) cut the shaving, (3) curl the shaving, (4) hold the double plane iron in place.

_____8. The principle of the cutting action of the plane iron is that of (1) wedge, (2) inclined plane, (3) lever, (4) wheel and axle.

_____9. When held correctly, a marking gauge is used (1) head tilted, pin trailing, (2) head upright, pin vertical, (3) head upright, pin horizontal, (4) head tilted, pin extended at least 1/4".

_____10. The graduations on most bench rules are multiples of (1) sixteenth, (2) eights, (3) twelfths, (4) tenths.

_____11. The measurement indicated by the arrow is (1) 5/8, (2) 3/4, (3) 13/16, (4) 7/8.



_____12. A try square is used for (1) measuring, (2) testing, (3) depth gauge (4) tapping.

_____13. A marking knife is used (1) to get accurate layout lines across the grain, (2) to mark with the grain, (3) in preference to pencil, (4) when line is not removed by later tool action.

_____ 14. In laying out duplicate parts (1) care must be taken, (2) all pieces are clamped together and laid out at the same time, (3) each piece is carefully laid out from drawing, (4) use duplicate gauge for layout.

_____ 15. To insure safety a chisel is held (1) firmly, (2) tightly in both hands, (3) one hand firmly--the other as a guide, (4) at a light angle to the cut.

_____ 16. When chiseling a mallet is used (1) for vertical chiseling, (2) if chisel is dull, (3) for hotizontal chiseling, (4) for heavy cuts.

_____ 17. Dull chisels (1) are easier to control as they cut more slowly, (2) are found in every shop, (3) can be identified by light reflected from the edge, (4) are hollow ground.

_____ 18. The tang of a chisel is (1) fitted into the socket, (2) fitted into the handle, (3) a swelled cup shape at the end of the blade, (4) necessary for safety.

_____ 19. A number 6 on an auger bit indicates a bit diameter of (1) 1/4, (2) 3/8, (3) 1/2, (4) 3/4"

_____ 20. The most suitable tool for shaping a curved surface is (1) knife, (2) spokeshave, (3) plane, (4) chisel.

_____ 21. Chattering when using a spokeshave usually indicates that (1) too much blade is exposed, (2) the blade is barely exposed, (3) the stroke is too fast, (4) too much pressure is applied.

_____ 22. Wood files are used (1) only when the edge tool will not do as good a job, (2) when a quick job is wanted, (3) when a fine edge is wanted, (4) by amateurs.

_____ 23. To insure safety, a file must be (1) chalked, (2) oiled, (3) fitted with a handle, (4) placed in a rack.

_____ 24. The simplest joint is (1) closed housing, (2) opening housing, (3) butt joint, (4) cross-lap joint.

_____ 25. A joint more suitable for nailing than gluing is (1) butt, (2) closed housing, (3) open housing, (4) cross lap.

_____ 26. The best tool for leveling a dado to depth is a (1) chisel, (2) gauge, (3) router plane, (4) Forstner bit.

_____ 27. The most suitable length of nail for fastening a butt joint having a cover piece 3/4 in. thick is (1) 3/4, (2) 1-1/4, (3) 2-1/4, (4) 3 in.

_____28. Nails are driven on an angle because (1) it is easier, (2) they are not so liable to ben., (3) they last longer, (4) they have better holding power.

_____29. The best type of abrasive for woodwork is (1) flint, (2) garnet, (3) emery, (4) sand.

_____30. A suitable grade of abrasive paper for sanding "between coats" is (1) 1/2-60, (2) 0-80, (3) 3/0-120, (4) 6/0-220.

_____31. A suitable grade of abrasive paper for "cleaning up" before finishing is (1) 1-1/2-40, (2) 1/2-80, (3) 3/0-120, (4) 6/--220.

_____32.As a general rule, never use abrasive paper (1) with the grain, (2) across the grain, (3) with a sanding block, (4) with too fine a grade of abrasive.

_____33. Splitting is prevented when planing end grain by (1) planing 2/3 across from each side, (2) having plenty of blade exposed, (3) clamping work tightly in a vise, (4) planing from the center outward.

_____34. The face edge mark indicates (1) a true surface at 90 deg. to face side, (2) a planed edge, (3) a true surface opposite the face side, (4) that the project has been made in a school shop.

_____35. The type of nail suitable for rough unfinished work is (1) common, (2) finishing, (3) cigar box, (4) escutcheon.

_____36. A nail suitable for cabinetwork and butt joints in project-making: (1) common, (2) finishing, (3) cigar box, (4) escutcheon.

_____37. Common nails are usually made from (1) mild steel, (2) carbon steel, (3) aluminum, (4) copper.

_____38. The gauge number of a screw refers to the (1) diameter of shank, (2) length, (3) number of threads, (4) number in a box.

_____39. A flathead screw in softwood requires (1) a pilot hole, (2) a countersink hole, 3) a shank hole, (4) shank and countersink holes.

_____40. Glue is spread (1) evenly on all contacting surfaces of a joint, (2) evenly on one of the contacting surfaces, (3) thickly over all surfaces of the joint, (4) thickly on one of the contacting surfaces.

_____41. "Dry clamping: insures (1) a strong joint, (2) no excess glue on finished surface, (3) that work can be assembled properly, (4) that the clamps work properly.

_____42. Clamps are applied to a project that has been glued to insure (1) that the glue will dry rapidly, (2) that the glue will cure properly, (3) correct alignment of parts when the glue dries, (4) that the point will not be unsightly.

_____43. A suitable temperature for most shop gluing is (1) 60, (2) 70, (3) 80, (4) 90 deg.

_____44. Finishing brushes are cleaned in (1) gasoline, (2) brush cleaner, (3) paint remover, (4) correct solvent for material used.

_____45. The teeth of a scroll saw are intended to cut on (1) downstroke, (2) upstroke, (3) both upstroke and downstroke, (4) any direction.

METALWORK

DIRECTIONS: Each of the questions below is followed by several choices. Select the best answer and put its number in the blank.

_______ 1. Band iron is (1) mild steel, (2) medium carbon steel, (3) carbon tool steel, (4) complex alloy steel.

_______ 2. The Beverly shear is never used to cut (1) black iron plate, (2) sheet aluminum, (3) galvanized iron, (4) wire.

_______ 3. The correct number of teeth for a hacksaw blade used to cut 1/2" round mild steel is (1) 14, (2) 18, (3) 24, (4) 32.

_______ 4. When band-iron is bent an allowance must be added when calculating to allow for (1) shrinkage, (2) stretch, (3) compression, (4) tension.

_______ 5. Before using a cold chisel with a mushroomed head, (1) get permission, (2) put on face shield, (3) get permission, to grind head back to normal, (4) use reasonable care.

_______ 6. A 1/16 black iron sheet may be shear-cut with a (1) cold chisel, (2) tin snips, (3) hacksaw, (4) band saw.

_______ 7. When stock 1/8 by 3/4 is to be sawed with a hacksaw blade horizontal, (1) saw across the narrowest surface, (2) saw across the widest surface, (3) saw diagonally across, (4) use a 24-tooth saw and saw anywhere.

_______ 8. The most useful hammer for general metal use is (1) tinner's, (2) claw, (3) blacksmith, (4) ball peen.

_______ 9. The two matched parts of the Whitney Punch are (1) tap and die, (2) punch and die, (3) punch and set, (4) die and set.

_______ 10. The mechanical principle of the Whitney Punch is (1) simple lever, (2) compound lever, (3) triple lever, (4) quarple lever.

_______ 11. 1-1/2 lb. of tinner's rivets, (1) weigh 1/2 lb. per 1000, (2) weigh 1-1/2 lb. per 100, (3) weigh 1-1/2 lb. each, (4) originally cost 1-1/2 pounds (English money) per 1000.

_______ 12. The commonest way to make a hole for a tinner's rivet in tinplate is, (1) to drill a hole, (2) a Whitney Punch, (3) to prick punch, (4) to punch a rivet through with a rivet set.

______13. The best file to use for rapid removal of mild steel stock is (1) single cut smooth, (2) single cut bastard, (3) double cut smooth, (4) double cut bastard.

______14. The most important reason for equipping files with handles is that (1) it is a school rule, (2) it results in better work, (3) it results in faster work, (4) the handles offer protection.

______15. Racks are provided for files (1) to prevent damage to file teeth, (2) for improved appearance, (3) for safety, (4) for easy checking.

______16. Chemical cleaning of a soldering copper involves the use of heat and (1) solder, (2) sal ammoniac, (3) file, (4) tin.

______17. Physical cleaning of a soldering copper involves the use of (1) solder, (2) sal ammoniac, (3) file, (4) tin.

______18. Soft solder is composed of (1) tin and lead, (2) tin and zinc, (3) lead and zinc, (4) lead, tin, and zinc.

______19. The soldering copper is a device used to (1) transfer heat, (2) to melt the solder, (3) melt the flux, (4) hold solder.

______20. When soldering, the soldering copper is moved slowly along the joint in order to (1) let the solder flow, (2) bring the metal to the same temperature as the iron, (3) melt the flux, (4) prevent oxidation.

______21. Resin-core solder is a must for (1) electrical joints, (2) tin-plate, (3) copper, (4) galvanized iron.

______22. Flux is used to (1) economize on the use of solder, (2) physically clean the surface, (3) cause rapid heat penetration, (4) prevent or dissolve oxidation.

______23. The correct forging temperature for mild steel is indicated by (1) bright yellow color, (2) cherry-red color, (3) dull red color, (4) whitish color.

______24. Carbon steel may be identified by (1) a torpedo-shaped spark, (2) bomblike radial sparks, (3) bomblike radial sparks mixed with torpedo-shaped sparks, (4) dull broken-line type sparks.

______25. The percentage of carbon in carbon steel is about (1) .10 to .5 percent, (2) between .5 and 1.5 percent, (3) 10 to 15 percent, (4) 15 percent.

_______26. The percentage of carbon in mild steel is (1) .10 to .30 percent, (2) between .60 and 1.30 percent, (3) 10 percent, (4) 13 percent.

_______27. The process of normalizing (1) tempers carbon tool steel, (2) removes the strains of forging, (3) hardens the steel, (4) case hardens the steel.

_______28. The correct hardening temperature for carbon steel is reached when the metal is (1) nonmagnetic, (2) at white heat, (3) at dull red heat, (4) a straw color.

_______29. Tool steel is hardened by heating it to the correct temperature and (1) cooling it in the furnace, (2) quenching in oil or water, (3) cooling it by placing in sand, (4) cooling slowly in air.

_______30. The correct area of a grinding wheel for general purposes to use is (1) the face, (2) the face and left side, (3) the face and right side, (4) any exposed surface.

31. A reasonable clearance between the tool rest and the face of grinding wheel is (1) 1/8" or less, (2) 3/16" (3) 1/4", (4) 5/16" or more.

_______32. When using a grinder, (1) goggles need not be worn, (2) goggles may be worn, (3) goggles must be worn, (4) use your own discretion about wearing goggles.

_______33. A countersink is used to (1) true up a drilled hole, (2) prepare a hole to receive a flatheat rivet or bolt, (3)counterbore, (4) make a pilot hole.

_______34. Generally speaking large drills are operated at (1) high speed, (2) medium speed, (3) low speed, (4) any speed is satisfactory.

_______35. A coolant for use wh n drilling is (1) cutting oil, (2) lube oil, (3) thread oil, (4) gear oil.

_______36. The correct placing of the drill-press belt for lowest speed is (1) the largest motor pulley to the smallest spindle pulley, (2) the smallest motor pulley to the largest pulley to the largest spindle pulley, (4) the smallest motor pulley to the smallest spindle pulley.

_______37. Work being drilled at the drill press is (1) held closely to the tool rest, (2) held in one's hand, (3) held by means of a clamping device, (4) clamped because it is a shop rule.

38.

_______38. Danger in grinding small objects arises through (1) the object overheating, (2) object slipping between the wheel and rest, (3) carelessness only, (4) the nervousness of the operator.

_______39. Final hand polishing of mild steel is done by (1) drawfiling, (2) 240-grit abrasive and oil, (3) 240-grit abrasive, (4) 80-grit abrasive and oil.

_______40. Metal projects are coated (paint, etc.) to (1) prevent corrosion, (2) improve appearance, (3) get a higher mark, (4) prevent corrosion and improve appearance.

DIRECTIONS: Match the terms found in the left-hand column with the statements found below.

_______41. A file with a single row of teeth

_______42. A process which results in a finished surface

_______43. Used for "tin cans"

_______44. Used to chemically clean soldering iron

_______45. Machinist hammer

_______46. Quick-cutting file

_______47. Used in layout of circles

_______48. Used to identify tool steel

_______49. Used to tin a chemically clean soldering iron

_______50. Sheet metal having one folded edge

(1) Accuracy	(7) Sal ammoniac
(2) Ball peen	(8) Single cut
(3) Dividers	(9) Single hem
(4) Double hem	(10) Soft solder
(5) Drawfiling	(11) Spark test
(6) Mild steel	(12) Double cut

EL..CTRICITY

Directions:

Each of the questions ˈ ꞉ . . ːs followed by several choices. Select the best answer and pu. . ˈ number in the parentheses on answer sheet.

1. The best known conductor of electricity is (1) silver, (2) gold, (3) copper, (4) tungsten.

2. A good nonconductor is (1) iron, (2) plastic, (3) aluminum, (4) tungsten.

3. The name of a device used to transform electricity to another form of energy is (1) lamp, (2) voltmeter, (3) generator, (4) dry cell.

4. The unit by which the rate of electron flow is measured is the (1) volt, (2) ampere, (3) ohm, (4) watt.

5. A negatively charged particle of electricity is called (1) electricity, (2) proton, (3) neutron, (4) atom.

6. The direction of flow of electrons in a circuit is from (1) the positive terminal to the negative terminal, (2) the north pole to the south pole, (3) the negative terminal to the positive terminal, (4) the south pole to the north pole.

7. The movement of electrons from one atom to another in a conductor is called (1) current, (2) voltage, (3) resistance, (4) load.

8. An atom which is negatively charged has (1) excess electrons, (2) excess protons, (3) excess neutrons, (4) a shortage of electrons.

9. The correct way to connect an ammeter into a circuit is (1) in series, (2) in parallel, (3) across the circuit, (4) series-parallel.

10. The instrument used to measure current flow is the (1) ammeter, (2) voltmeter, (3) ohmmeter, (4) hydrometer.

11. The unit of potential difference is the (1) ohm, (2) volt, (3) ampere, (4) electron.

12. A device which converts chemical energy to electrical energy is the (1) dry cell, (2) generator, (3) photocell, (4) crystal pickup.

13. The crystal pickup on a record player depends for its operation on (1) chemical action, (2) piezoelectric effect, (3) light, (4) heat.

14. An increase in the size of electrodes in primary cells results in greater (1) voltage (2) current, (3) resistance, (4) usefulness.

15. Polarization of a primary cell results in (1) greater efficiency, (2) deposits of nitrogen gas on positive electrode, (3) increased current, (4) decreased voltage.

16. Storage cells (1) are more readily discharged than dry cells, (2) may be recharged many times, (3) are cheaper for the same voltage, (4) cannot be recharged as readily as dry cells.

17. A storage cell stores (1) electrical energy, (2) chemical energy, (3) physical energy, (4) kinetic energy.

18. Suitable plates for a simple storage cells are (1) lead plates, (2) one lead plate, one copper plate, (3) zinc plates, (4) one carbon plate, one zinc plate.

19. The voltage of dry cells connected in series is (1) the sum of voltage of the combined cells, (2) the product of voltage of the combined cells, (3) the same as one cell, (4) 3 volts.

20. When measuring with a voltmeter in a circuit the instrument is (1) connected in series, (2) connected in parallel, (3) connected in series-parallel, (4) connected "in" the line.

21. The instrument used to measure potential difference in a circuit is the (1) ammeter, (2) voltmeter, (3) ohmmeter, (4) pressure gauge.

22. Resistance in a circuit is (1) opposition to the flow of current, (2) very harmful, (3) increased by using wires of larger size, (4) lessened by raising the temperature.

23. Resistance is measured in (1) volts, (2) ohms, (3) amperes, (4) farads.

24. A conducting path would have greatest resistance if made of (1) copper, (2) iron, (3) nichrome, (4) aluminum.

25. Increasing the length of the conductor causes (1) an increase in voltage, (2) no decrease in voltage, (3) an increase in current, (4) an increase in resistance.

26. Material suitable for a heating element is (1) copper, (2) iron, (3) nichrome, (4) aluminum.

27. A short circuit occurs when there is (1) high resistance, (2) practically no resistance, (3) low voltage, (4) high voltage.

28. A hot plate having a resistance of 20 ohms is plugged into a 110 volt circuit, the current flowing in the circuit is (1) 5.5 amperes, (2) 1.5 amperes, (3) 55 amperes, (4) 155 amperes.

29. A flashlight lamp is connected to a 1-1/2 volt dry cell and uses .1 ampere of current, the resistance of the lamp is (1) 15 ohms, (2) 1.5 ohms, (3) .15 ohms, (4) 0.15 ohms.

30. The number of paths offered in a series circuit is (1) 1, (2) 2, (3) 2 or more, (4) at least 3.

31. The number of paths offered in a parallel circuit is (1) 1, (2) 2, (3) 2 or more, (4) at least three.

32. The correct wire to use for an electric iron is (1) a heater cord, (2) a lamp cord, (3) a #14 two-wire loomex. (4) an annunciator wire.

33. Worn extension cords are dangerous because (1) of danger from a short circuit, (2) they may blow a fuse, (3) they may not be able to use portable equipment when wanted, (4) they are unsightly.

34. The plug on an extension cord is removed from a convenience outlet by (1) pulling on the wire, (2) grasping the plug and pulling it until it releases, (3) using a plug ejector, (4) whipping it out by snapping on the cord.

35. The most serious result of attempting to remove a plug from an ungrounded convenience outlet while holding a water tap could be (1) nothing at all, (2) a shock, (3) a burn, (4) death.

Directions: Each of the following statements describes one of the terms listed below.

_______36. The unit of measure for a specific flow of electrons

_______37. A charged atom which contains more or less than its normal number of electrons

_______38. The unit of electrical resistance

_______39. The unit of electromotive force

_______40. A device used to open or close a circuit

_______41. A solid, liquid, or gas through which the electrons pass easily

_______42. The movement of electrons through a conductor

_______43. The complete path of an electric current

(1) Ampere	(5) Insulator	(9) Switch
(2) Circuit	(6) Ion	(10) Volt
(3) Conductor	(7) Ohm	
(4) Current	(8) Resistance	

DIRECTIONS: Each of the following terms describes one of the electrical symbols illustrated below.

_______44. (1) Ammeter

_______45. (2) Atom

_______46. (3) Buzzer

_______47. (4) Cells in parallel

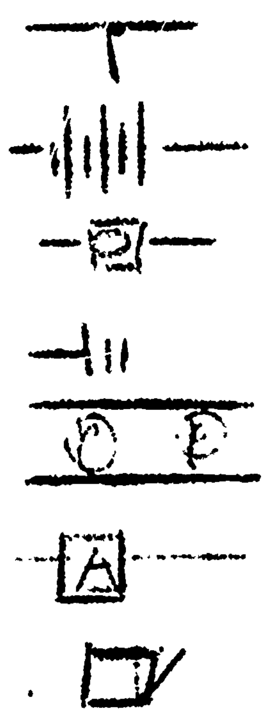
_______48. (5) Cells in series

_______49. (6) Ground

_______50. (7) Lamps in parallel

(8) Push button

(9) Tap splice



APPENDIX (g)

TELEVISION EQUIPMENT INVENTORY

WASHINGTON JUNIOR HIGH SCHOOL

Quantity	Item	Model No.
2	Packard Bell fixed interlace Television Cameras	#920
	One camera equipped with Canon C-16 Zoom Lens	#105361
	One camera equipped with a turret holding	
	1 - Canon 1" Lens	
	1 - Canon 2" Lens	#10144
	1 - Elgeet 13mm f1.5 Wide Angle Lens	#A4962
	1 - Elgeet 3" Telephoto Lens	#A4040
2	16" Setchell-Carlson Monitors (Jeeped)	#16P66
1	Packard Bell Sound and Picture Modulator	#MPS-15/16
1	Dynair Modulator and Transmitter	#TX1B
2	Western Electric Intercom Headsets	
1	Rauland Audio-visual Mixer-Preamplifier	#2104
1	Dynair Multiple Input Video Switcher	#VS-6CL-A
4	Low impedance Shire lavalier type Microphones	#647A
1	TV Mobile Table - St. Charles Mfg. Co. Custom-made	
1	Samson Tripod with #7241 Head and #7601 Dolly	
	23" Westinghouse Stratovision Television Sets	ETV9205
6	Wilson Television Stands	W54SE
1	Ampex Video Tape Recorder	VR 7000
1	Wilson Video Tape Recorder Cart	W30VTR
Several	25' lengths coaxial and intercom cables	
Several	supplementary light sources	

United States Senate

COMMITTEE ON
INTERIOR AND INSULAR AFFAIRS

September 29, 1966

Mr. Charles E. Jaquith, Principal
Washington Junior High School
811 Washington Road
Kenosha, Wisconsin 53140

Dear Mr. Jaquith:

It took quite some time from my telegram to you of July 21st extending unofficial congratulations for approval of your research contract entitled "An Experimental Study Utilizing Closed Circuit Television in an Industrial Arts Team Teaching Program," until today when I received formal notice of approval of a negotiated contract in the amount of $8,761.

I am rather pleased to see your pilot project to improve pupil motivation and increase teacher effectiveness and efficiency endorsed by the Office of Education. Industrial arts instruction is vitally important to the student as a potential employee and to the industries which depend on their skills. I was proud to stress the value of your proposal.

Sincerely yours,

Gaylord Nelson

GAYLORD NELSON
U. S. Senator

GN:p

1967 THEME — "QUALITY LEADERSHIP — KEY TO THE FUTURE"

Kiwanis Club of Kenosha BULLETIN

GOLDEN ANNIVERSARY 1917 1967 COMMUNITY SERVICE

INCORPORATED UNDER THE LAWS OF THE STATE OF WISCONSIN

KIWANIS CLUB OF KENOSHA WAS CHARTERED APRIL 28, 1917

Week of April 2, 1967

THIS WEEKS PROGRAM:

Our speaker will be Mrs. Ronald Sackewitz, President of the Kenosha County Association for Mental Health. Mrs. Sackewitz will enlighten us as to the functions and goals of the association at National, State and Local levels. Mental health has been, and continues to be one of the major problems facing every citizen of our complex world of today.

LAST WEEKS PROGRAM:

Thanks to Charles Jaquith, Principal of the Washington Jr. High School, our regular luncheon room was converted for one hour to a simulated television studio. We were taken on a guided teaching tour which enabled us to see from the student's eyes as he sits in the classroom. Our tour included viewing films which were taped at some of our local factories, and which are used in teaching Industrial Arts and Sheet Metal classes. Only in this way are students able to see a factory operation which in many cases would be too dangerous to witness up close. We learned that by using television in the classroom the teacher has much better control of of his students due to the fact that each one is able to see clearly from his seat and television holds his attention much better than a teacher could from the front of a classroom. The teacher is also free to circulate about the room to give help where needed without disrupting the entire class. It would appear that this means of teaching may well be used in every classroom of the not too distant future. Thanks are certainly due Mr. Jaquith and his very able assistants who were Frank Perri, Richard Mark, Robert Desmarais, Robert Bart and Richard Cross.

50th ANNIVERSARY PROGRAM:

Tickets are now available - See Art Gail or any member of the 50th Anniversary Committee.

PROM - AFTERGLOW:

Get your work schedule questionnaire to V-Pres. Larry Hastings no later than this Wednesday.

BOARD MEETING

Monday, April 3rd, southeast room, Elks Club, dinner at 5:45 p.m. Committee Chairmen - if you have not submitted your regular monthly report please do so at this meeting. Appoint a man from your committee to attend if you are unable to do so. Members requiring a makeup should attend this meeting. New members are welcome.

(over)

TREMPER HIGH SCHOOL

Wisconsin • 53140

Phone: 694-1100

HOSMANEK, Principal

Assistant Principals:
AUBRY B. HOOPER
ELVIN KRANEN

April 14, 1967

Mr. Charles Jaquith, principal
Washington Junior High School
811 Washington Road
Kenosha, Wisconsin 53140

Dear Chuck:

It's a pleasure to extend my thanks and appreciation for the excellent program you and your staff presented at the Southeastern Wisconsin Industrial Arts meeting at Tremper High, on April 8.

Last week, at a meeting in Milwaukee, I met a number of teachers and administrators who were at the April 8th meeting and their spontaneous, complimentary comments about your experimental program in T-V at Washington Junior High were most gratifying to hear.

A number of the administrators indicated that letters of appreciation and commendation were sent to the superintendent of schools.

May I extend my wish for your continued success in this highly important experiment in the use of television in the classroom.

With best wishes,

Ed Kriz

Ed Kriz, chairman
Southeastern Wisconsin
Industrial Arts Conference

Snap-on Tools Corporation

MANUFACTURERS OF... WRENCHES AND MECHANICS TOOLS FOR INDUSTRIAL PRODUCTION AND MAINTENANCE—AUTOMOTIVE TEST EQUIPMENT AND REPAIR TOOLS

KENOSHA, WISCONSIN 53140

May 9, 1967

Mr. Charles E. Jaquith
Project Director
Washington Junior High School
811 Washington Road
Kenosha, Wisconsin 53140

Re: Closed Circuit Television in an Industrial Arts Team Teaching Program

Dear Mr. Jaquith:

The members of the Operating Board of Snap-on Tools Corporation were very much impressed with the viewing of the video tape which your staff presented at our April meeting.

The Board feels that your staff did an exceptional job on the tape realizing that some adverse conditions prevailed.

To summarize our feelings, we can say we have developed a very understanding and a meaningful relationships with the staff at Washington Junior High School, as a result of this fine project.

We shall look forward to future participation in the program.

Very truly yours,

SNAP-ON TOOLS CORPORATION

Personnel Manager

CEFischer/cs

AMERICAN MOTORS CORPORATION

5626 TWENTY-FIFTH AVENUE • KENOSHA, WISCONSIN 53140

May 16, 1967

Mr. Charles E. Jaquith, Principal
Washington Junior High School
811 Washington Road
Kenosha, Wisconsin 53140

Dear Mr. Jaquith:

I believe that it has been approximately six months since you first met with us to explain your television project. Since that time it has grown from the initial meeting with three representatives of local industry to a complete and well accepted exposure to the over-all industrial complex here in Kenosha. These companies, 18 in all, range from the largest which employs at the present time approximately 15,000 employees to the smallest whose current employment runs about 85. Over-all these local industries account for approximately 90 percent of the local work force.

It is important that I sight these statistics so as to place in proper perspective the fine job that has been done with this project.

Speaking for American Motors, Kenosha Division, I can personally attest to the acceptance of the program. Many of our key personnel including our Plant Manager, Plant Engineer, Manufacturing Manager and others are impressed with the potential of benefits which could derive from a school-industry cooperative effort such as this. Proof of this is in the open door policy afforded you and your staff in whatever project you choose to undertake.

Your considerate and businesslike approach in the handling of this program has been a major reason for its success and I am confident that you can look forward to even a closer relationship in the coming months.

Very truly yours,

AMERICAN MOTORS CORPORATION

W. R. Wilberg

W. R. Wilberg
Manager Salaried Personnel

KENOSHA MANUFACTURERS' ASSOCIATION

KMA

ESTABLISHED 1907

512 - 56th STREET KENOSHA, WISCONSIN 53140

PHONE 654-2596

Ford Charlton, Executive Director

May 25, 1967

Mr. Charles E. Jaquith, Principal
Washington Junior High School
811 Washington Road
Kenosha, Wisconsin

Dear Mr. Jacquith:

One of our major concerns in this community is to further the important partnership of education and industry. In recognition of industry's constantly increasing need for higher levels of skill and training in employees, we have been devoting a great deal of attention to helping our educational system gear its program to the needs of the community industry.

We believe your video tape project will prove to be a more highly effective method of helping students to achieve a better understanding of the world of work than anything that has been developed thus far. This project has already caught the interest of several of our manufacturers, and we are sure that it will receive good participation and support.

Sincerely,

Ford Charlton

Ford Charlton
Executive Director

FC/ls

MACALESTER COLLEGE

SAINT PAUL, MINNESOTA, 55101

■ AUDIO-VISUAL CENTER ■ CLOSED CIRCUIT TELEVISION ■ EDUCATIONAL TELEVISION

August 4, 1967

Mr. Charles E. Jaquith, Principal
Washington Junior High School
811 Washington Road
Kenosha, Wisconsin

Dear Mr. Jaquith:

Thank you for inviting me to comment on the use of your video tape recorder in a team teaching effort on industrial arts.

The taped demonstrations appeared to be well done when considering that neither of the instructors had ever received training in the use of a television video recorder. The fact that they were good instructors was apparent in the presentation of the subject matter. No doubt their desire and enthusiasm of doing for the student via video tape what could not physically in time or effort be accomplished in traditional ways of teaching, contributed much to the total effectiveness of their project.

Their own self-evaluation via video tape contributed considerably to the improvement of their instruction and consequently their efficiency in using video tape.

In my judgment, the demonstration presented on video tape would help considerably in reducing the number of individual repeat demonstrations required of the instructors.

Perhaps the greatest factor in this project is that it is unique in its concept arising out of the imagination of two creative teachers.

With very best regards, I am,

Sincerely yours,

Robert A. Bauman
Director of Audio Visual

RAB:ngr

APPENDIX (i)

DESCRIPTION OF TAPES OF INDUSTRIAL PROCESSES

The content of the tapes of industrial processes was based upon operations in the course of study, and the availability and willingness of local industries to allow us to use their facilities. Our final round of industrial video tapes consisted of a tape from each of the representative areas of work in the course. We have tapes of basic industrial processes in sheet metal, bench metal, electricity and plastics.

In the sheet metal area, the automated gas tank fabrication line at American Motors was taped. The material shown in this tape correlates with the sheet metal operations performed in the classroom. Basically, the processes shown were layout, forming with dies, spot welding, continuous seam welding, and soldering. The size of the dies, the press work, and continuous seam welding were operations which could not be duplicated in the classroom. This tape also contained a good sequence of automated machines and is a significant aid in helping students develop a concept of automation.

In the bench metal area, the manufacture of wrenches by Snap-on Tools was taped. This tape correlated with the operations in the course of layout, forming heavy metal, heat treating, filing, buffing, and polishing. In addition, the related operations of die making and forging, which are not possible to duplicate in the classroom, were shown. Another valuable asset of this tape is that it illustrates the process of manufacturing from the time the product was on the engineering drawing boards until it is boxed for shipment.

In the electrical area, the production of printed circuit boards by the Dynamatic Division of Eaton, Yale, and Towne was taped. This tape correlated with the instruction in the use of circuit boards, printed circuits and the assembling of electronic projects. This tape also showed extensive and detailed samples of the steps in the making of a printed circuit board. This not only made the manufacturing process easier to understand but contained complete directions for duplicating the process.

The plastic area tape covered the making of a plastic container that becomes part of a commercial rug cleaning machine manufactured by the Racine Industrial Products Co. This tape clearly showed the dies, ovens, and the vacuum forming process. Since the industrial process related so directly to the vacuum forming operations in the class-room, the instructors did their own audio-commenting in order to relate and compare how we were using our own equipment in a similar fashion.

APPENDIX (j)

STAFF UTILIZATION

Project Director	Charles E. Jaquith, Principal Washington Junior High School
Principal Investigator	Robert Baetz, Instructor Washington Junior High School
Second Investigator	Robert Desmarais, Instructor Washington Junior High School
Clerk	Mrs. Emma Grno, Secretary Washington Junior High School

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Consultants	Function
- Mr. Martin Bach, Director Department of Pupil Services Kenosha Public Schools	-Assisted in determination of evaluation procedures and in choice of instruments.
- Mr. Richard Mach, Consultant Department of Audio-visual Services Kenosha Public Schools	-Assisted in planning and utilizing television procedures.
- Mr. Mark White, A-V Coordinator Washington Junior High School	-Assisted in production of video tapes of demonstrations and industrial tapes.