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ABSTRACT

To evaluate the Utah State Board of Education's Integrated Shop Program (ISP) for small rural high schools, 7 ISP schools in their 2nd year (1970-71) of the ISP were compared on 3 measures to 2 selected control schools (small rural high schools that offered vocational agricultural mechanics and industrial arts but did not offer formal courses in drafting or power mechanics). On pre- and post-tests designed for the ISP, 9th and 10th graders in the control schools performed better in the areas of woodwork, building construction, and metal fabrication but did not perform as well in drafting and power mechanics as did students in the ISP schools; the overall average significantly (.05 level) favored [illegible] students. On the Cooperative Industrial Arts Tests, prepa[illegible]ndardized by the Educational Testing Service, the ISP 9th and 10th graders scored significantly higher (0.5 level) in drawing than the control students but fared the same as the control students in the areas of woods, metals, and electricity/electronics. This test battery was also administered to the 9th-grade industrial arts students at 2 Utah urban junior high schools; these students scored better in all areas than either ISP or control students (significant difference was reached at the .05 level in all areas except woods). On the Stanford Achievement Test--High School Technical Comprehension, 11th- and 12th-grade control students scored higher (but not significantly at the .05 level) than the corresponding ISP students. (BO)

FINAL REPORT

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UTAH
INTEGRATED SHOP PROGRAM

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PREFACE

The Integrated Shop Program has been operating on a pilot basis for the past two years. The first year the program was in seven high schools, and was expanded to ten high schools the second year. The following excerpts are from a paper prepared by Dr. W. E. Mortimer explains the origin and philosophy of the Integrated Shop Program: ". . . about two or three years ago the Vocational-Technical Division of the State Department began a systematic approach toward the development of a program of vocational education which could be implemented in small high schools to provide a much broader and deeper offering than most of them had ever had in the past. This program has come to be known as the Integrated Shop Program.

By the time schools opened in the fall of 1969, this program was ready for implementation in seven of the small high schools of the state. It was organized and s[illegible] four year examplary program for occupational preparation in selected agricultural and industrial activities for small high schools. The content of the program was drawn from t areas of Industrial Arts, Trade and Industrial Education, and Agricultural Mechanics.

The General Nature of the Program

There are many kinds of vocationally oriented courses which could be offered in a program of this nature. However, it is impossible to offer a great variety of them in a small high school. Even though the interests of students may be many and varied and it would be desirable from their standpoint to have a great variety of offerings, it is not economically

feasible to offer all of the types of work that students might desire. Recognizing this fact, the committee working in the preliminary phase of this project selected the general areas of drafting, woodwork and building construction, metal fabrication, and power mechanics as the programs to be offered.

The reasons for this selection are as follows:

1. All of these kinds of work are important in modern society. In fact, the total number of jobs related to these four areas of work represent a large and important segment of the labor force, and there are usually ample opportunities for employment.

2. Many of the school shops in small high schools already have a considerable amount of the basic equipment needed to teach these courses. Most of them also have the building space needed.

3. Students generally have interests in one or more of these areas. Of course, some students may have interests and aptitudes in important industrial and agricultural areas not herein represented, but in terms of the limitations which small high schools operate it seems that these particular areas would serve the needs of more students than most others which might be selected.

The first two years of the program, ninth and tenth grades, are largely exploratory in nature although skill training is included. At the conclusion of this part of the program a student who is interested in obtaining additional training selects one or possibly two specialized areas in which he will obtain greater depth of training during the eleventh and twelfth grades. . ."

. . . . . .

Objectives of the Program

" The major, over-all purpose of the project is to provide improved programs of occupational preparation in the small high schools of Utah so that students from such high schools may be better prepared than they

presently are or have been to enter industry or to continue their education and training at a post-secondary institution. More specific objectives may be stated as follows:

1. To provide a type of vocational training for students in the first two years of high school which will help them to acquire basic skills and knowledge in important industrial and agricultural activities, yet at the same time will allow them to explore the fields of drafting, woodwork, and building construction, power mechanics, and metal fabrication with a possible view towards selecting one of these as his occupational field.

2. To provide students who elect to specialize in one or two of the four major areas of work offered in the Integrated Shop Program with high quality skill training and concomitant knowledge, so that they may be prepared for entry jobs in industry in their chosen field or for more advanced training at a post-secondary institution.

3. To assist students in acquiring those personal and social traits which help them to be worthy citizens and valuable employees.

4. To assist students in finding employment upon completion of their training program and to help keep them employable and employed.

. . . . . .

Seven criteria were set up for the schools, school districts, and communities to meet when the original seven schools were selected. The criteria are as follows:

1. The school district superintendent and the high school principal must have a keen interest in trying a new program such as this and in supporting it to the extent that it can be successful.

2. The teachers must be competent to teach the subject areas included in the program or must be willing to prepare themselves so that they will be competent. In addition, they must have an interest in the examplary program and must do everything possible to make it successful.

3. The schedule of classes within a school must be such that students desiring the program will be able to register for it Also, there must be enough students enrolled in the in the program to make it a fairly economic unit in the school system.

4. The physical facilities must be of such a nature that the space and equipment are adequate, or can be readily modified so that they are adequate, to accommodate the recommended program.

5. The school district must be in such a financial condition that it can furnish its share of the costs of the program. This would include its portion of:
   a. The teacher's salary
   b. The remodeling of the shop or shops
   c. The tools and equipment
   d. The supplies

6. If it is at all feasible, the community in which the expansion schools are located should have some industry related to one or more of the major areas offered in the training program.

7. The parents of the students who desire to enroll in the program should be willing to have their children engage in such a program and should be interested in supporting it so that it can be successful."

EVALUATION OF THE SECOND YEAR OF "INTEGRATED SHOP PROGRAM"

The evaluation procedure for the Integrated Shop Program pilot program in the seven small rural high schools and two control schools consisted of the following:

1. A pre-test and post-test for each of the one-semester courses (Drafting, Power Mechanics, Metal Fabrication, Woodwork, and Building Construction) plus equivalent courses in the two control schools.

2. A pre-test and post-test for each of the advanced courses (Metal Fabrication III and IV and Power Mechanics III and IV) and in the equivalent courses in the two control schools.

3. A standardized test (Cooperative Industrial Arts Tests - see Appendix A) covering the areas of drawing, metals, woods, electricity, and electronics was administered to the students who were, or had been, registered in Drafting I, Woodwork and Building Construction I, Metal Fabrication II and Power Mechanics II, in the 9th and 10th grades at the Integrated Shop Program schools, and in the equivalent courses at the two control schools.

4. A standardized test (Stanford Achievement Test High School/ Technical Comprehension - see Appendix B) was administered to the students registered in the advance courses in Metal Fabrication III and IV and Power Mechanics III and IV, in the 11th and 12th grades at the Integrated Shop Program schools. And in the equivalent courses in the two control schools.

5. Informal interviews with students in the Integrated Shop Program schools.
6. Interviews with the principals of each of the seven Integrated Shop schools.

Pre-test and Post-test

During the workshop in the summer of 1970 the participants for pilot high schools (vocational agriculture teachers and industrial arts teachers), under the direction of Dr. W.E. Mortimer, revised the guides that had been developed during the workshop held in the summer of 1969, and used during the school year 1969-70. In addition, the participants developed the guides for Metal Fabrication III and IV and for Power Mechanics III and IV. During the workshops mentioned above, unit tests were developed and revised for each of the four guides and unit tests were developed for each of the two advanced courses. From these unit tests a comprehensive pre-test and post-test was developed for each of the six guides.

These instruments were administered to the students at the beginning of the semester, and again at the end of the semester for the beginning courses, and at the beginning of the year and at the end of the year for the advanced courses.

Two control schools, that were as near like the seven pilot schools in size and geographic location as was possible, were selected by the advisory committee. Inasmuch as the instructional material developed was for the students normally registered for Vocational Agricultural Mechanics and Industrial Arts classes, the pre-test and post-test was administered to the students registered in Industrial Arts and Vocational Agricultural Mechanics courses at the control schools.

Findings

Table I depicts the average number of points gained between mean scores of the classes on the pre-test and post-tests. The area of drafting showed the greatest amount of gain, with an average gain for all ten Integrated Shop Program schools of 29.6 points. The least amount of gain was in the area of Woodwork and Building Construction, with an average gain of 14.3 points. It can also be noted in Table I that the control schools made a substantial gain in the areas of Woodwork and Building Construction I and Metal Fabrication II, with an average gain of 24 points and 19.5 respectively. The least amount of gain by the control schools was in the area of Power Mechanics.

Table I also notes a rather wide span between average points gained in each of the four areas by the different schools. For example, in the area of Metal Fabrication II, school "A" showed an average gain of 44 points between the pre-test and post-test while school "C" showed a gain of only (1) one point. Each of the other areas show similar variations among the ten schools.

Table I indicates that control school number I is stronger in the area of Woodwork and Building Construction I than any of the Integrated Shop Program schools and control school II is stronger in the area of Metal Fabrication II than all of the Integrated Shop Program schools except school "A". It should be noted that the two control schools did not teach a formal course in the areas of Drafting and Power Mechanics.

In comparing total points gained by the Integrated Shop Program schools, and the points gained by both control schools in all four areas, there was a significant difference between them at the .05 level.

Table I. Average Points Gained Between Pre-test and Post-test by Program and School.

SCHOOL	DRAFTING	WOODWORK AND BUILDING CONSTRUCTION I	METAL FABRICATION II	POWER MECHANICS II	AVERAGE FOUR PROGRAMS
A	43	*	44	*	
B	25	9	6	14	
C	23	18	1	12	
D	24	19 12	17	21	
E	49 49	17 19	24	19 28	
F	25	25	27	41	
G	19	22	13	20	
H	19	3	19	1	
I	29	2	17	24	
J	21	*	6 12	0	
Av. ISP School	29.6	14.3	18.6	18.8	20.33**
Control School I	12	33	6	9	
Control School II	11	15	33	6	
Av. Control Sch.	11.5	24	19.5	7.5	15.63

*Complete data was not available.

** Significant at the .05 level.

Table II shows the mean/percent scores on the pre-test and post-test for each of the four areas and for each of the ten Integrated Shop Program schools, and the two control schools and also the gain made between the pre-tests and post-tests.

In comparing the average points gained between the means of the pre-test and post-test for the school year 1969-70 and 1970-71, it can be seen on Table III that there was a gain in each area of instruction with a significant gain in the area of Drafting I for the Integrated Shop Program schools. The gain shown for the control school (s) does not give a true picture because of a change in the control school. The control school used for the 1969-70 school year, adopted the Integrated Shop Program curriculum for the school year 1970-71 and was not eligible to be used any longer as a control school. Two additional high schools from two districts were identified by the Integrated Shop Program advisory committee and permission was granted by the superintendents of the two districts to use one of their high schools in each district as a control school for the purpose of evaluation of the Integrated Shop Program.

Table II. Comparison of Pre-test and Post-test Scores by Schools.

SCHOOLS	DRAFTING			BUILDING CONSTRUCTION			POWER MECHANICS			METALS		
	Pre-test	Post-test	Gain	Pre-test	Post-test	Gain	Pre-test	Post-test	Gain	Pre-test	Post-test	Gain
A	33	76	44	40	*	*	83	*	*	38	82	44
B	30	55	25	42	51	9	43	57	14	44	50	6
C	38	61	23	41	59	18	53	65	12	45	46	1
D	31	55	24	41 45	60 57	19 12	52	73	21	37	54	17
E	16 24	65 73	49 49	45 41	62 60	17 19	48 50	67 78	19 28	36	59	24
F	16	41	25	33	58	25	36	77	41	[illegible]	66	27
G	33	52	19	42	64	22	47	60	[illegible]	[illegible]	56	20
H	27	46	19	53	56	3	35	36	1	36	55	19
I	30	59	29	47	49	2	53	77	24	38	55	17
J	32	53	21	*	49	*	55	55	0	34	40	6
Control School I	26	37	11	40	55	15	41	47	6	40	73	33
Control School II	35	47	12	45	78	33	45	54	9	41	47	6

*Complete data was not available.

Table III. Comparison of Average Points Gained in Integrated Shop Program and Control School Programs for 1969-70 and 1970-71.

GROUP	DRAFTING I		WOODWORK AND BUILDING CONSTRUCTION I		METAL FABRICATIONS II		POWER MECHANICS II	
	1969-70	1970-71	1969-70	1970-71	1969-70	1970-71	1969-70	1970-71
I. S. P.	20.2	29.6	12.8	14.3	14.0	16.6	13.9	18.8
CONTROL SCHOOLS	.93	11.5	.12	24.0	3.7	19.5	3.7	7.5

Standardized Test

In order to get an additional evaluation instrument to evaluate the Integrated Shop Program that would be independent of any input by participants of the Integrated Shop Program and the control schools, a search was made for a standardized test instrument that would test the content contained in the Integrated Shop Program. Two instruments that appeared to meet the need were located: (1) The Cooperative Industrial Arts Tests, a new test battery prepared and published by Educational Testing Service, Princeton, New Jersey (see Appendix A). This test has been standardized for the 7th, 8th, and 9th grades and was administered to the students enrolled in the 9th and 10th grade Integrated Shop Program classes and the equivalent classes at the control schools. As an additional comparison, this test battery was administered to the 9th grade Industrial Arts students at two junior high schools in the urban areas of Salt Lake Valley.

As stated in the introduction of this report, the ninth and tenth grade Integrated Shop Program is largely exploratory in nature. This is also the major purpose of the Industrial Arts Program at the junior high school level in Utah.

The purpose of comparing the ninth grade urban junior high school industrial arts students achievement with the achievement of the ninth and tenth grade student registered in the Integrated Shop Programs was to ascertain whether or not the students registered in the Integrated Shop Programs were achieving at an equal or higher level than the students registered in the two urban junior high schools.

(2) The high school Technical Comprehension Test of the Stanford Achievement Test Battery (see Appendix B), was administered to students

registered in the advanced Integrated Shop Program classes, made of 11th and 12th grade students, and to the equivalent classes at the control schools.

Results

The test results from the Cooperative Industrial Arts Test are shown on Table IV. It can be noted from the table that the raw scores among the Integrated Shop Program schools are quite close, with the largest spread of 13 points being in the drawing area. A look at the percentile rank indicates a spread of 68. A comparison of the percentile rank of the average raw score of the two control schools indicates no significant difference between them, except in the area of drawing, which was significant at the .05 level. It is interesting to note, however, the differences in all four areas between the Integrated Shop Program schools, the control schools, with the scores of the urban junior high schools. There was a significant difference at the .05 level in the areas of drawing, metals, and electronics and electricity, between the scores received by the I.S.P. students and the scores received by the urban junior high school students.

The results from the Stanford Achievement Test - High School Technical Comprehension, that was administered to 11th and 12th grade students registered in the Integrated Shop Program and the equivalent classes at the control schools, are shown in Table V. It can be noted that the student from the Integrated Shop Program schools and from the control schools achieved at approximately the same level. The control schools were slightly higher, but the difference was not significant at the .05 level. The

Table IV. Comparison of Scores Received by I.S.P. Schools, Two Control Schools, and Two Urban Junior High Schools on the Cooperative Industrial Arts Tests.

SCHOOL	DRAWING		WOODS		METALS		ELEC. & ELECT.	
	Raw Score	%ile Score	Raw Score	%ile Score	Raw Score	%ile Score	Raw Score	%ile Score
A	21	25	24	36	24	39	25	34
B	32	84	26	47	29	66	29	51
C	25	48	26	47	23	33	28	47
D	22	31	24	36	26	51	22	25
E	28	64	30	68	27	55	26	37
F	19	16	28	58	24	39	20	19
G	20	20	28	58	22	28	18	14
Control School I	17	9	25	42	25	45	23	28
Control School II	19	16	29	63	23	33	19	16
TOTAL I.S.P.	*23*	*37**	*27*	*52*	*25*	*45*	*22*	*25*
TOTAL CONTROL	18	13	27	52	24	39	21	22
Urban Jr. High	36	93**	29	63	40	99**	34	73**

*Significant at the .05 level between I.S.P. and Control.

** Significant at the .05 level between Urban Jr. High and I.S.P.

Table V. Comparison of Scores Received by I.S.P. Schools and Two Control Schools on the Stanford Achievement Test - High School Technical Comprehension.

SCHOOL	RAW SCORE	STANDARD SCORE	%ILE SCORE
A	43	60	50
B	43	60	50
C	48	64	68
D	48	64	68
E	49	64	68
F	49	64	68
G	47	63	64
Control School No. I	48	64	68
Control School No. II	50	65	72
TOTAL I.S.P.	47	63	64
TOTAL CONTROL SCHOOL	49	65	72 *

* Not significant at the .05% level.

percentile scores are based on a national average for this test and show both of the above groups to be well above the national average.

Interviews with the Principals and Selected Students.

As a result of the two summer workshops each instructor has a comprehensive course of study for each of the areas he taught in the Integrated Shop Program. Each instructor was also furnished with sufficient copies of the instructional packets for each student to have his own copy. These packets are designed so that a student can proceed at his own pace on an individual basis. In this way the Integrated Shop Program makes allowance for individual differences and permits the teacher to do a great deal of individual instruction.

The writer interviewed the principal of each of the schools (7 of 7).

Major strength of the Integrated Shop Programs reported by the principals were:

1. Courses organization is an improvement over previous course organization. (unanimous).
2. Teachers able to do better planning and more logical preparation. (unanimous).
3. Students more familiar with what was expected of them. (unanimous).

Major weakness of the Integrated Shop Program reported by the principals were:

1. Students with poor reading ability are having trouble with the increased reading necessary in the program. (4 of 7 principals expressed this concern.)

The writer randomly selected from each of the 9th and 10th grade Integrated Shop classes he tested 2 to 3 students depending on the size of the class to interview.

Major strength of the Integrated Shop Program as reported by the students interviewed were:

1. Course was well organized, and they knew what they were supposed to be doing each period. (majority expressed this opinion.)

2. Course content was revelent to their needs as they saw them. (majorith expressed this opinion.)

Major weakness of the Integrated Shop Program as reported by the students interviewed was:

1. The amount of reading required in the packets was discouraging. (approximately one-third expressed this opinion.)

Observations

The following comments are based on observations by the writer during visits to the Integrated Shop Program schools.

Trade knowleage and manipulative skills are important in getting and holding a job. Equally important, if not more important, are the safe working habits and attitudes a worker possesses. In several of the shops visited, the eye-safety program passed by the Utah Legislature was practically non-existent. Students were observed using such equipment as the metal lathe, welding torches, grinders with no shields or tool rests, crawling under motor vehicles, and operating miscellaneous power equipment without goggles or safety shields. In several shops students who were operating a piece of power equipment also had three to four students as observers. None of them wore safety glasses, in addition to creating an unsafe working condition.

In one shop the writer visited, he noted the unsafe practice of students blowing off saw dust, etc. from themselves and fellow students with the air hose at the end of a period. He also observed one student casually give another student a blast of air in the ear. This instance

was not observed by the instructor and to the writer's knowledge, was never reported to the instructor. The writer in reviewing the published guides for the 9th and 10th grades, found a limited amount of material relating to safety in general and safety as it relates to the use of power equipment.

In several of the schools where the writer observed the students at work with the written material, it was noted that the students often did not read the text material in its entirety, but used the index to look up pages that would help them answer specific questions.

Conclusion

1. It can be concluded that the students who are enrolled in the Integrated Shop Program are achieving more understanding and skills in their training than are students in the control schools, as measured by the pre-test - post-test instrument. (significant at the .05 level.)

2. It can be concluded that the achievement of the students who are enrolled in the 9th and 10th grade Integrated Shop Program was not signigicantly higher than the students in the control schools in the areas of woods, metals, electricity, and electronics, but was significantly higher at the .05 level in the area of drawing as measured by the Cooperative Industrial Arts Tests.

3. It can be concluded that the students enrolled in the 9th grade industrial arts program in the urban junior high schools tested are achieving more understanding and skills in their training than the student in the Integrated Shop Program as measured by the Cooperative Industrial Arts Test in the areas of drawing, metals, and electricity and electronics. (significant at the .05 level).

4. It can be concluded that the curriculum content of the Integrated Shop Program and the curriculum content of the Industrial Arts and Vocational Agricultural Mechanics classes at the control schools are equally good in preparing students in the technical areas of drafting, building construction, metal fabrication, electricity and electronics, and power mechanics, as measured by the Technical Comprehension Test of the Stanford Achievement Test Battery. (not significant at the .05 level.)

5. It can be concluded that the instructors of the Integrated Shop Program need to devote more time and/or put a greater emphasis on developing the safe working attitudes and habits within the shop, especially in the area of eye safety.

6. It can be concluded that the principals of the schools in which the Integrated Shop Program has beentested on a pilot basis are satisfied with the program.

7. It can be concluded that a majority of the students who have been in the Integrated Shop Program are satisfied with the program.

APPENDIX A

The Cooperative Industrial Arts Tests had their origin in July 1964, when representative of the American Industrial Arts Association (AIAA) and the American Vocational Association (AVA) met with test specialists from Educational Testing Service (ETS) to explore the feasibility of developing standardized tests in the industrial arts. In spite of the fact that the lack of a standardized curriculum posed a major barrier to the development of such instruments, it was agreed that a continuing program of evaluation was urgently needed and that standardized measures based on current curriuclar offerings would serve as a starting point from which to evaluate both ongoing and innovative programs.

Test development committees, nominated by the AIAA and AVA, were charged with the tasks of preparing test specifications and writing test items. Each committee was responsible for the test in a specific field.

To ensure that the test questions would reflect the most important outcomes of instruction, each committee prepared detailed specifications that listed the knowledge, understanding, and skills that students might be expected to gain. These specifications appear in Appendix B of the handbook.

Having prepared the specifications for the test in their field of responsibility, the members of each test committee participated in an item-writing workshop conducted by members of the ETS Test Development Division. After this brief orientation to desirable item-writing practices and common pitfalls to be avoided, each committee member accepted responsibility for preparing 25 to 50 questions in specific areas.

The questions prepared by committee members were returned to ETS where members of the Test Development Division carefully edited each question to remove ambiguities and ensure consistency of style. The questions resulting from this procedure were then reproduced in test-review book form -- one book for each of the five industrial arts areas. Each of these test-review books contained 300 to 400 questions. A copy of the appropriate book was distributed to members of each committee for review and comment.

The review books were returned to ETS for further analysis, and members of the Test Development staff modified or discarded questions in accordance with the suggestions of the test committee members. For each of the five areas covered by the Cooperative Industrial Arts Test Series, test questions that survived review and editing by committee members and ETS personnel were assembled in pre-test forms. There were three pre-tests in General Industrial Arts and four pre-tests in each of the other areas: Drawing, Electricity/Electronics, Metals, and Woods. Each pre-test consisted of 50 four-option, multiple-choice questions.

These pre-tests were administered in the Spring of 1968 to schools selected in accordance with the recommendation of educators and administrators in the industrial arts field.

Ten final forms, two for each of the five tests in the series, were assembled on the basis of item analyses made of the pretesting results. These forms were standardized in the spring of 1969 and constitute the Cooperative Industrial Arts Test Series.

DRAWING

These tests measure students' understanding of the fundamentals of drawing, ability to apply that understanding in communication and in problem-solving, and, to a lesser extent, knowledge of the uses of drawing in industry and of drawing as a career. Test questions cover six major areas of achievement in drawing : shape description, size description, drawing techniques, alphabet of lines and lettering, equipment, and industrial applications and career information.

The area of shape description, to which the largest number of questions is devoted, is divided into two subareas. Pictorial shape description includes isometric, perspective, and oblique views; nonpictorial shape description includes principal and auxiliary views, developments, and sections.

Size description includes questions on notes and on dimension selection and placement. Drawing covers freehand and instrumental drawing, drawing materials, and methods of reproduction. These three areas receive approximately equal emphasis.

ELECTRICITY/ELECTRONICS

These tests measure achievement in eight broad areas of the field of electricity and electronics. The areas are: electrons, circuits, magnetism, measurement, devices, safety, occupations, and tools and materials.

The greatest number of questions involves circuits and covers sources of electromotive force, current, resistances, and connections. Questions on both permanent magnets and electromagnets are included, and measurement questions are stated in terms of volts, ohms, watts, and amperes. The second largest number of questions pertains to devices and deals with those used for communication and control, those that are mechanically operated, and those involving heat and light. The safe operation of equipment and personal safety are covered by a few test questions.

METALS

These tests cover four broad areas of knowledge and skill. Major emphasis is on hand and machine operations including such topics as heat-treating, forging, casting, cutting, finishing, forming, and joining.

Project planning and design (measuring and communication), safety, and the metals industry (mining, production methods, occupational information, and consumer knowledge) share equally in the number of items devoted to each.

WOODS

These tests measure five broad areas of achievement in woods and woodworking. The areas of tools and processes receive major emphasis. Materials and safety account for some of the questions, and a few are devoted to the wood industry.

Questions about hand tools cover those used for layout and measuring, cutting, boring, holding, and driving. Both jigsaws and drill presses are treated under power tools. The processes that provide content for questions include designing and planning, cutting to size and shape, joining and fastening, and finishing. Both the kind of materials and their selection are covered, as are personal safety and safe use of equipment. Questions concerning the wood industry involve the industry itself (for example, lumbering) and related occupations.

APPENDIX B

The high school level of Stanford Achievement Test is an extension of Stanford Achievement Test. The purpose and intended use of the High School Battery is essentially the same as that of the elementary batteries: to test the educational achievements that are commonly expected of students in a modern comprehensive school.

Most comprehensive high schools have special courses for college preparatory, business, and certain technical curriculums. The tests in the high school battery are designed not only to test special instruction in these three areas, but also are applicable in the evaluation of the areas as they reflect the objectives of general education. In a society in which people are concerned daily with business and technical activities, at home and at work, it seems appropriate to evaluate all students with regard to to their fitness to meet such demands. The technical comprehension test is designed to serve two functions; (1) as a general test in the field of industrial arts and (2) as a measure of technical comprehension and applied science for the educated citizen.