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ABSTRACT

A study asked 287 industrial technology education (ITE) teachers in Nebraska to identify what equipment was being used by ITE students. It also compared ITE equipment usage with regard to school type and school size. The response rate was 59.2 percent (n=170). Findings indicated the drill press and band saw were the most widely used pieces of equipment by Nebraska's seventh- and eighth-grade ITE students. Eighth graders from middle/junior high schools indicated the highest seventh- and eighth-grade usage. Robot arm usage was notably higher for eighth-grade students from middle/junior high schools. Comparing the use of equipment by eighth-grade ITE students by school size showed again that the drill press and band saw were the most widely used. An examination of high school ITE equipment usage noted that the drill press was the most widely used by all grades (10, 11, and 12) and both types of high schools (senior high and junior-senior high). Generally, equipment had a higher use percentage at the junior-senior high schools than at the senior high schools, except for the volt-ohm meter. Equipment such as the drill press, band saw, table saw, grinder, jointer, radial arm saw, disc sander, wood lathe, arc welder, and oxygen-acetylene welder were still widely used by Nebraska's ITE students. Schools with fewer than 759 students had a higher percentage of ITE equipment usage than the larger schools. (Fifteen data tables are appended.) (YLB)

Nebraska

Industrial Technology Education

Teachers Identify The Equipment

Their Students Use

A Research Paper
Presented At
The American Vocational Association
1995 Conference
Denver, Colorado

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by
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Over the last decade, industrial arts education programs across the state of Nebraska, as well as the nation, have contemplated retooling their programs to provide students instruction in industrial technology education. This transition has not been rapid and in some cases resistance to the updated curriculum has not allowed the change. According to Obermier (1994) only 34 of Nebraska's industrial arts education programs have converted to what has been termed the "modular technology education system."

The focus of current research in industrial technology education has also been on the use of "modular technology education systems" in schools across the nation. The research on "modular technology education systems" has centered on module titles, inter-disciplinary teaching, and the importance of "technology". However, little inquiry has been conducted as to what industrial technology education equipment is actually being used in today's schools. In order to properly prepare tomorrow's industrial educators, teacher educators must identify what industrial technology education equipment is being utilized.

The Nebraska Department of Education annually conducts a survey of secondary schools across the state. The survey indicates course titles and enrollment in the state's industrial technology education programs. However, course titles do not

truly reflect what types of processes are being performed, nor what type of equipment is being used.

Purpose

The purpose of this study was to identify what equipment is currently being used by Nebraska's industrial technology education students. A secondary purpose was to compare industrial technology education equipment usage with regard to school type and school size.

Research Questions

More specifically, this study addressed the following questions:

1. What equipment is used by the greatest number of industrial technology education students in Nebraska's middle schools, junior high schools, senior high schools, and junior-senior high schools?

2. Is there a difference between the percentage of industrial technology education equipment usage in Nebraska's schools with regard to the school's type; middle/junior high, senior high, and junior-senior high?

3. Is there a difference between the percentage of industrial technology education equipment usage in Nebraska's schools with regard to the school's size?

Methodology

In order to answer these questions, a survey instrument was developed which identified 27 different types of industrial technology education equipment, which grade level (6-12) each type of equipment was used, the type of school (middle, junior high, senior high, and junior-senior high), and the size of the school. School size was indicated as categorized by the Nebraska School Athletic Association (1995). Class A schools have between 2000 and 844 students, class B; 728 to 275 students, class C; 259 to 95 students, and class D; less than 94 students. No course titles were identified, as the purpose of the study was not to correlate course title with equipment.

Population and Sample

The population for this study consisted of Nebraska's 574 industrial technology education teachers. A sample of 287 industrial technology education teachers was randomly selected. The sample was mailed a cover letter, the survey instrument, and a postage-paid return envelop. The response rate was 59.2% (N=170). This reflected almost one-third (29.6%) of Nebraska's industrial technology education teachers.

Of the 170 responses, 24 (14.1%) were from middle schools, 11 (6.5%) from junior high schools, 27 (15.9%) from

senior high schools, and 108 (63.5%) from junior-senior high schools (grades 7-12). Middle schools (n=24) and junior high schools (n=11) were grouped together (n=35, 20.6%) for further data analysis.

Forty of the schools (23.5%) were larger than 844 students (class A), 29 (17.1%) schools were classified as class B (728-275 students), 51 schools (30.0%) were class C (259-95 student), and the smaller class D schools, less than 94 students, accounted for 29.4% (n=50) of the responses.

The majority of middle schools and junior high schools were in the larger school size categories. Classes A and B accounted for 97.2% of these types of schools. There were no class D middle schools or junior high schools. The majority of junior-senior high schools (grades 7-12) were in classes C or D (86.1%).

The findings of this study are presented by the industrial technology education students' grade level, with middle/junior high schools analyzed first and then high school equipment usage is examined. Grades seven and eight are noted for the state's middle/junior high schools, while high school equipment use is indicated for grades 10, 11, and 12. Grade six was not discussed in this report because only ten schools noted equipment usage by sixth grade industrial technology education students. Ninth grade industrial technology

education students were not included because of their overlap between junior high, senior high, and junior-senior high schools. Additionally, only the highest percentages of equipment usage are included. It was felt that lower usage percentages would not assist in answering this study's research questions.

Findings

Middle and Junior High Level Usage

The drill press and band saw were the most widely used pieces of equipment by Nebraska's seventh and eighth grade industrial technology education students. The highest seventh and eighth grade usage of the drill press and band saw were indicated by eighth graders from middle/junior high schools, 91.4% and 88.6% respectively. (See Tables 1 and 2) As indicated on Tables 3 and 4, robot arm usage was notably higher for eighth grade students from middle/junior high schools.

Comparing the use of equipment by eighth grade industrial technology education students by school size showed again that the drill press and band saw were the most widely used. (See Table 5) Class A schools indicated a higher eighth grade use of robot arms and CNC milling machines than did the smaller size schools.

Senior High Level Usage

An examination of high school industrial technology education equipment use noted that the drill press was the most widely used by all grades (10, 11, & 12), and both types of high schools (senior high & junior-senior high). Tables 6 through 11 indicate the tenth, eleventh, and twelfth grade use of industrial technology education equipment by both senior high schools and junior-senior high schools. Generally, equipment had a higher utilization percentage at the junior-senior high schools than at the senior high schools, except for the volt-ohm meter. One piece of industrial equipment, which has been labeled as obsolete, was ranked in the top half for usage by both types of high schools and all grades. That piece of equipment was the wood lathe.

Table 12 and 13 notes that the CNC lathe, CNC milling machine, and robot arm were used by between 25.9% and 49.1% of Nebraska's high school industrial technology education students. Little variation in the percentage of CNC and robot arm usage was indicated between the senior high schools and the junior-senior high schools.

The eleventh grade was selected to compare high school industrial technology education equipment usage by school size. (See Table 14) Overall, class B high school students

indicated the highest percentage of industrial technology education equipment usage. With class A schools showing the lowest percentages of equipment use. Notably, the smaller class B, C, and D high schools had the highest use percentages for the CNC lathe, CNC milling machine, and robot arm.

The findings of this study indicated that equipment such as the drill press, band saw, table saw, grinder, jointer, radial arm saw, disc sander, wood lathe, arc welder, and oxygen-acetylene welder are still widely used by Nebraska's industrial technology education students. The research also noted that class B, C, and D schools, less than 759 students, had a higher percentage of industrial technology education equipment utilization than the larger, class A schools.

Conclusion

The findings of this research suggest that industrial technology teacher education programs must continue to prepare teachers with competence in the operation of the equipment mentioned. Additionally, future industrial technology education teachers must continue to be prepared with skills in various industrial processes performed by the basic industrial equipment of the discipline.

The data further suggest that Nebraska's teachers are also utilizing contemporary industrial technology education

equipment, such as CNC lathe, CNC milling machine, and robot arm. Therefore, future industrial technology education teachers must possess expertise in the operation of this equipment and pedagogical competency related to teaching this technology.

Analysis of the data further supports the findings of Rogers and Mahler (1994) and Obermier (1994) that Nebraska's industrial technology education teachers are not abandoning the teaching about industrial processes for "modular technology education." Traditional industrial education equipment is still extensively used by industrial technology education teachers across the state. The ability to properly operate industrial equipment is still an essential element of industrial technology teacher education.

References

Nebraska Department of Education. (1995). Industrial Technology Education Annual Report and Directory. Lincoln, NE: Author.

Nebraska School Athletic Association. (1995). [Categories and classification of school districts]. Unpublished raw data.

Obermier, T. R. (1994). Modular facilities and curriculums for technology education: Blessing or curse? Paper presented at the meeting of the Mississippi Valley Industrial Teacher Education Conference, Nashville, TN.

Rogers, G.E. & Mahler, M. (1994). Non-acceptance of technology education by teachers in the field. Journal of Technological Studies, 2(1), 15-20.

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

Most widely used equipment in middle schools/junior high schools. (N=35)

7TH GRADE

Drill Press	65.7
Band Saw	58.1

8TH GRADE

Drill Press	91.4
Band Saw	88.6
Scroll Saw	68.6
Disc Sander	68.6
Robot Arm	68.6
Buffer	54.3
Box & Pan Brake	54.3

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

Most widely used equipment in junior-senior high schools. (N=108)

7TH GRADE

	%
Drill Press	59.3
Band Saw	56.5

8TH GRADE

Drill Press	79.6
Band Saw	75.0
Scroll Saw	62.0
Disc Sander	58.3

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

CNC and robot arm usage in middle schools/junior high schools. (N=35)

7TH GRADE

	%
Robot Arm	34.3
CNC Mill	14.3
CNC Lathe	8.6

8TH GRADE

Robot Arm	68.6
CNC Mill	25.7
CNC Lathe	11.4

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

CNC and robot arm usage in junior-senior high schools. (N=108)

7TH GRADE

	%
Robot Arm	24.1
CNC Lathe	7.4
CNC Mill	4.6

8TH GRADE

Robot Arm	33.3
CNC Lathe	15.7
CNC Mill	13.9

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

8TH GRADE

Equipment	CLASS A	B	C	D
Drill Press	89.4	90.4	76.2	82.7
Band Saw	89.4	85.7	72.0	76.3
Scroll Saw	78.7	61.8	56.8	63.6
Box & Pen Brake	50.0	33.3	6.4	8.5
CNC Lathe	10.7	14.2	17.0	14.8
CNC Mill	32.2	4.7	21.2	8.5
Robot Arm	71.5	52.3	31.7	29.7
N	28	21	47	47

*Adjusted Percentages

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

Most widely used equipment in senior high schools. (N=27)

10TH GRADE

	%
Drill Press	85.2
Grinder	77.8
Disc Sander	74.1
Band Saw	66.7
Table Saw	66.7
Jointer	66.7
Arc Welder	66.7
O-A Welder	63.0
Volt-ohm Meter	63.0
Wood Lathe	59.3
Radial Arm Saw	59.3
Horizontal Band Saw	59.3

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

Most widely used equipment in junior-senior high schools. (N=108)

10TH GRADE

	%
Drill Press	95.4
Table Saw	92.6
Band Saw	91.7
Jointer	89.8
Grinder	88.9
Wood Lathe	83.3
Radial Arm Saw	81.5
Disc Sander	77.8
Scroll Saw	72.2
O-A Welder	71.3
Arc Welder	68.5
Surfacer	67.6

NEBRASKA
Industrial Technology Education Equipment Usage Survey

Most widely used equipment in senior high schools. (N=27)

11TH GRADE

	%
Drill Press	92.6
Grinder	85.2
Arc Welder	77.8
Disc Sander	74.1
O-A Welder	70.4
Volt-ohm Meter	70.4
Band Saw	66.7
Table Saw	66.7
Jointer	66.7
Wood Lathe	66.7
Horizontal Band Saw	63.0
Radial Arm Saw	63.0

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

Most widely used equipment in junior-senior high schools. (N=108)

11TH GRADE

	%
Drill Press	97.2
Band Saw	95.4
Table Saw	95.4
Grinder	94.4
Jointer	92.6
Wood Lathe	87.0
Radial Arm Saw	85.2
Disc Sander	85.2
O-A Welder	84.3
Arc Welder	81.5
Scroll Saw	75.0
Surfacer	71.3

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

Most wide used equipment in senior high schools. (N=27)

12TH GRADE

	%
Drill Press	96.3
Grinder	88.9
Arc Welder	81.5
O-A Welder	74.1
Disc Sander	77.8
Volt-ohm Meter	70.4
Band Saw	66.7
Jointer	66.7
Table Saw	66.7
Wood Lathe	66.7
Radial Arm Saw	63.0
Horizontal Band Saw	63.0

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

Most widely used equipment in junior-senior high schools. (N-108)

12TH GRADE

	%
Drill Press	96.3
Table Saw	96.3
Grinder	95.4
Band Saw	95.4
Jointer	92.6
Radial Arm Saw	87.0
Wood Lathe	87.0
O-A Welder	85.2
Disc Sander	84.3
Arc Welder	87.4
Scroll Saw	75.9
Surfacer	71.3

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

CNC and robot arm usage in senior high schools. (N=27)

10TH GRADE

	%
CNC Lathe	37.0
CNC Mill	37.0
Robot Arm	37.0

11TH GRADE

	%
CNC Lathe	40.7
CNC Mill	37.0
Robot Arm	37.0

12TH GRADE

	%
CNC Lathe	40.7
CNC Mill	37.0
Robot Arm	37.0

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

CNC and robot arm usage in junior-senior high schools. (N=108)

10TH GRADE

	%
CNC Lathe	43.5
CNC Mill	33.3
Robot Arm	25.9

11TH GRADE

	%
CNC Lathe	49.1
CNC Mill	35.2
Robot Arm	30.6

12TH GRADE

	%
CNC Lathe	49.1
CNC Mill	37.0
Robot Arm	30.6

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

11TH GRADE

EQUIPMENT	CLASS A	B	C	D
Drill Press	87.5	100.0	98.0	96.0
Grinder	87.5	100.0	88.0	96.0
Disc Sander	68.8	100.0	86.0	78.0
Arc Welder	68.8	78.9	86.0	80.0
O-A Welder	56.3	84.2	88.0	82.0
Band Saw	56.3	100.0	94.0	92.0
Table Saw	50.0	100.0	96.0	92.0
Jointer	50.0	100.0	94.0	88.0
Radial Arm Saw	50.0	94.7	80.0	86.0
N	16	19	50	50

*Adjusted Percentages

NEBRASKA
Industrial Technology Education
Equipment Usage Survey

11TH GRADE

EQUIPMENT	CLASS A	B	C	D
Wood Lathe	50.0	94.7	86.0	86.0
Metal Lathe	31.2	36.8	24.0	20.0
CNC Lathe	25.0	63.2	44.0	52.0
Mill	25.0	31.6	14.0	10.0
CNC Mill	25.0	42.1	42.0	30.0
Robot Arm	25.0	52.6	34.0	24.0
Volt-Ohm Meter	68.8	73.6	68.0	54.0
N	16	19	50	50

*Adjusted Percentages