This document presents three papers dealing with trade and industrial education research. "Educating the Vocational Teacher Educator" (Clyde Knight) reports a study to identify needs of vocational teacher educators to improve existing programs and make necessary changes in doctoral programs. "The Relationship between Perceived Learning Style and Teaching Style of Occupational Educators" (Ray Sanders, Michael Galbraith) presents findings of a study to examine the perceptual learning modalities of junior college occupational educators and how they thought they learned best and to compare this learning style preference to the teaching methodologies used in their instructional situations. "A Comparison of Beginning Drafting Achievement between Students Using Traditional Equipment and Students Using Computer Aided Design and Drafting Equipment" (Dennis Murphy) reports that no significant difference was found in the achievement of beginning drafting competencies between students using traditional drafting tools compared to students using computer-aided design and drafting tools. (YLB)
Foreword

The Trade and Industrial Education Research Committee is a standing committee of the Trade and Industrial Education Division of the American Vocational Association. The mission of this committee is to promote systematic inquiry as a means of improving the quality of trade and industrial education programs and services. The committee accomplishes this mission through the organization of T&I research sessions at the annual American Vocational Association Conference and the development and dissemination of timely reports and monographs related to trade and industrial education.

This document contains three papers that were presented at the Trade and Industrial Education Research Committee’s carousel session at the 1987 American Vocational Association Convention, Las Vegas, Nevada. These papers were selected for inclusion in this document following a blind juried review by members of the T&I Research Committee. The T&I Research Committee would like to thank the respondents to our call for papers. These are the researchers who have made the annual T&I Research session a reality.

Gene L. Roth, Chair
Trade and Industrial Education Research Committee
Trade and Industrial Education Research Committee Members

**Term Expires 1987 Convention**

Dr. Robert McCough (Region 1)
International Vocational-Technical Training
Westinghouse Corporation
Box 866
America City Building, #300
Columbia, MD 21043

Dr. Scott Whitener (Region 1)
Convention

Dr. Patrick O'Reilly (Region 2)
Vocational-Technical Education
Virginia Polytechnic Institute & State University
Blacksburg, VA 24061

Dr. William E. Schoonmaker (Region 3)
University of Minnesota
College of Education
Division of Industrial Education
425 VoTech Building
St. Paul, MN 55108

Dr. Gonzalo Garcia, Jr. (Region 4)
Texas A&M University
Dept. of Industrial Vocational Technical Education
Room 620 Harrington
College Station, TX 77843

Dr. Craig Anderson (Region 4)
School of Occupational & Adult Educ.
College of Education
Oklahoma State University
Stillwater, OK 74078

Dr. Robert Miller (Region 5)
Northern Arizona University
College of Design & Technology
Box 6003
Flagstaff, AZ 86011

**Term Expires 1988 Convention**

Dr. Scott Whitener (Region 1)
Center for Occupational Education
Ferris State College
Big Rapids, MI 49307

Dr. Richard Walter (Region 1)
Dept. of Vocational-Technical Educ.
State University of New York
Oswego, NY 13126

Dr. Hugh Swogger (Region 2)
Dept. of Vocational & Career Dev.
College of Education
Georgia State University
Atlanta, GA 30303

Dr. William Wolansky (Region 3)
Science and Technology
Industrial Education Department
Iowa State University
Ames, IA 50011

Dr. Rick Sullivan (Region 4)
Dept. of Industrial Education
Central State University
Edmond, OK 73034

Dr. Warren Suzuki (Region 5)
Oregon State University
Dept. of Vocational & Technical Educ.
Corvalis, OR 97331-2404
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Rutgers University
State University of New Jersey
Graduate School of Education
New Brunswick, NJ 08903

Dr. Dennis Tesolowski (Region 2)
Clemson University
College of Education
Department of Industrial Education
Clemson, SC 29631

Dr. Jack Wamble (Region 3)
Southeast Missouri State University
College of Science and Technology
Dept. of Industrial Technology & Education
Cape Girardeau, MO 63701

Dr. Jay T. Smith (Region 4)
Jackson State University
School of Science & Technology
Dept. of Technology & Industrial Arts
Jackson, MS 39217

Dr. Doug Hammer (Region 5)
Utah State University
College of Engineering
Industrial Tech & Educ. Dept.
Logan, UT 84322

Chairperson: Dr. Gene L. Roth (until 1988 convention)
Northern Illinois University
Office for Vocational, Technical and Career Education
155 Gabel Hall
DeKalb, IL 60115

Chair-Elect: Richard Walter
Dept. of Vocational-Technical Education
State University of New York
Oswego, NY 13126

Secretary: Don McKay (until 1988 convention)
Dept. of Industrial Education and Technology
Iowa State University
Ames, IA 50011

Term Expires 1990 Convention

Don McKay (Region 3)
Dept. of Industrial Education & Technology
Iowa State University
Ames, IA 50011

Hervey R. Galloway (Region 5)
Trade & Industrial Education
Three Capitol Mall
Education Building West
Little Rock, AR 72201-1083

Dr. Steve Chi-Yin Yuen (Region 4)
Dept. of Industrial & Vocational Education
University of Southern Mississippi
Hattiesburg, MS 39406

Dr. Norman Peterson (Region 3)
University of Missouri
103 Industrial Education
Columbia, MO 65211
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SECTION A

Educating the Vocational Teacher Educator

Clyde Knight
EDUCATING THE VOCATIONAL TEACHER-EDUCATOR

By

Clyde Belin Knight
Trade & Industrial Education and
Chairman of the Graduate Studies Committee
for the School of Occupational & Adult Education
College of Education
Oklahoma State University
406 Classroom Building
Stillwater, OK 74078-0406

Approved by the Research Committee
School of Occupational & Adult Education
Funded by the College of Education
Oklahoma State University
Stillwater, Oklahoma
August, 1987
Educating the Vocational Teacher-Educator

Introduction

With the increasing national interest in and criticism of teacher education programs the past few years, institutions responsible for training vocational teachers and developing their programs for teacher education need to be closely examined to determine if problems exist in the selection and education of the vocational teacher-educator. This study analyzes current developmental practices and ways to improve vocational educator education.

Problem

Though the Holmes and Carnegie Reports of 1986 addressed the problems of educating teachers, identifying teacher-education programs which succeed or fail, they have not addressed educating the teacher educator. Specifically, the problem is a lack of unity or coherence in requirements for the development of current vocational teacher-educators and suggestions to improve the development of successful vocational teachers for these technically-oriented, rapidly changing times.

Research Questions

This study answered the following:

1. What background experiences have teacher-educators in doctoral degree-granting universities had to prepare them to be vocational teacher-educators?

2. What specific educational experiences have they had to prepare them to be vocational teacher-educators?
3. What special work experiences did they have to prepare them to be vocational teacher-educators?

4. What university courses did they have to specifically prepare them to become vocational teacher-educators?

5. What curriculum changes (specific courses and other experiences) would they recommend for educating future vocational teacher-educators?

Population

The population for this study is the 36 major vocational teacher-educator education institutions with five or more vocational disciplines that grant a doctoral degree (identified in Adams and Biehms, 1984, Information Monograph No. 1, printed by the University Council for Vocational Education). Eighteen of the identified institutions were members of the University Council for Vocational Education (UCVE), and 18 were not, so group differences are also noted.

Purpose

This study identifies needs of present and future vocational teacher-educators in order to improve existing programs and to make any necessary changes in doctoral programs.

Findings

In the eight vocational certification disciplines (Agriculture, Business and Office, DE/Marketing, Health, Home Economics, Industrial Arts, Technical Education, and Trade and Industrial) of their 18 institutions, the UVCE institutions have 130 vocational-education certification specializations. The other 18 institutions have 117.
Head teacher-educators from UCVE institutions returned 78 (60%) of the surveys, and non-UCVEs returned 44 (37%) for a total of 122. Coordinators from the 18 UCVE institutions returned 16 (88%) of the surveys, and non-UCVE returned 11 (61%) for a total of 27.

The lengths of service as a teacher-educator ranged from zero to 30 years with 14 mean average years of experience. The years of experience as a teacher before becoming a teacher-educator ranged from zero to 21 with a seven year mean average.

Only 18% of the vocational teacher-educators had vocational education courses in secondary school; 70% have baccalaureate degrees, and 60% have master's in the specialization for which they are teacher-educators.

Nine of the 122 (7%) head teacher-educators held baccalaureate degrees, 40 (33%) held master's degrees, and 73 (60%) held doctorate degrees when they were hired as teacher-educators. Forty-one of the 122 identified their first choice reasons for pursuing a doctoral degree as "to be a vocational teacher-educator," and 38 specified "to be a college professor of their vocational discipline." For becoming a teacher-educator, 105 of the 122 teacher educators listed teaching experience as one of their most valuable work experiences; teacher educators in all eight disciplines believed the four higher education experiences most beneficial to them in rank order were: 1) research techniques, 2) curriculum development, 3) advanced methods of teaching, and 4) principles/foundations of vocational education. (See Table I for the top 14 of 43 items.)

The 27 coordinators identified 27 different courses that should be required for all teacher educators. In rank order the top five are: 1) History, Principles, and Philosophy of Vocational Education (19), 2)
Research (12), 3) Program Planning/Curriculum Development (11), 4) Evaluation of Vocational Education (10), and 5) Statistics (8). Table I shows some major disagreements as well as agreements as to the most valuable courses and experiences for developing career teacher-educators and what the university vocational coordinators report as presently required courses. The 122 teacher-educators recommended 39 kinds of courses or specific experiences that should be included in a doctoral program of study for developing the vocational teacher-educators. (Items listed by more than one teacher educator are in Table II.)

Conclusions/Recommendations

Occupational experience in the vocational discipline is most important in the development of teacher educators. Teaching experience before becoming teacher educators is an important work experience. A master's degree in vocational teacher-education (in the specific discipline) is an important part of the educational background for teacher-educators. Therefore, specific core courses identified by all disciplines should be analyzed and updated to include these experiences needed by all teacher educators.

The 27 institutional coordinators listed courses and experiences now required which were different from those the 122 vocational teacher-educators believed should be course requirements and/or seminar experiences for preparing vocational teacher-educators.

The top ten most helpful college courses and experiences identified by the 122 teacher educators and the 27 vocational education coordinators as being currently required should be considered for all teacher-educator doctoral programs.
Institutions offering doctoral programs for developing teacher educators should study all items listed on Tables I and II to be sure their programs are not overlooking important teacher-educator competencies.

A specific foundations or "capstone" course should be established for the best possible professional preparation of teacher-educators.

National standards for educating vocational teacher-educators should be established.

Selected References


Erekson, T. and Gloeckner, G. (December, 1986). *University teaching in industrial education: Demographic factors.* Dallas, TX.


For the complete report—all research and findings—contact the author.

Clyde B. Knight, 416 Classroom Building, Oklahoma State University, Stillwater, OK 74078-0406.
<table>
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<th>Rank Order by Teacher Educators</th>
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<th>Voc Educator Coord N-27</th>
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*These items are not listed by teacher educators. (The teacher educators listed 43 items; the vocational coordinators 27).*
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Number of responses: 43 33 27 10 41 41 9 46 250
Total respondents: 25 18 11 6 21 19 4 18 122
SECTION B

The Relationship Between Perceived Learning Style and Teaching Style of Occupational Educators

Ray Sanders

Michael W. Galbraith
THE RELATIONSHIP BETWEEN PERCEIVED LEARNING STYLE
AND TEACHING STYLE OF OCCUPATIONAL EDUCATORS

By

Ray E. Sanders, M.S. (Presenter)
Instructor of Trade and Industrial Education
Oklahoma State University
School of Occupational and Adult Education
406 Classroom Building
Stillwater, OK 74078-0406
405/624-6275

Michael W. Galbraith, Ed.D
Assistant Professor of Higher and Adult Education
University of Missouri-Columbia
Department of Higher and Adult Education and Foundations
301 Hill Hall
Columbia, MO 65211
314/882-8231
Relationship Between Perceived Learning Style and Teaching Style of Occupational Educators

The analysis of teaching styles and learning styles is an important area of inquiry which has received a considerable degree of attention over the past two decades. While an awareness exists that educators communicate an identifiable set of classroom behaviors known as a teaching style, less emphasis is placed upon the teacher's own preferred learning style. As Cornett (1983) suggests, "whatever the teacher's learning style, it will have an effect on his or her teaching style" (p. 14). It was further argued that teachers tend to teach the way they learn. This relationship has not been examined in occupational education.

Learning style refers to the preferred way that individuals transform and assimilate information; its how the learner constructs meaning out of stimuli (Kolb, 1984). Every individual has a unique learning style, however, this style may be adjusted depending on the learning task confronting them and the teaching style being used. At best, styles are overall patterns that give general direction to learning behavior (Cornett, 1983).

Learning styles can be examined from three broad perspectives: cognitive, affective, and physiological. The cognitive aspects of learning style includes the way an individual processes, decodes, encodes, stores, and retrieves information (Kirby, 1979; Kolb, 1976, 1984). This cognitive aspect is characterized by the learners ability to focus or scan, randomly or sequentially, concretely or abstractly, the information. Each of these pairs of cognitive processes can be represented on a continuum, and given
times and the various instructional situation a switch in orientation can occur.

Another way of examining learning styles can be from an affective aspect. This aspect of learning style includes emotional and personality characteristics related to motivation, locus of control, interests, persistence, responsibility and sociability (Messick, 1976; McCarthy, 1981). Depending upon the learner, praise and external reinforcement may have a positive effect on the learning process while at other times the effect may be negative.

Finally, the physiological aspects of learning style which relate to sensory perception and environmental characteristics, can be examined (Dunn & Dunn, 1978; Barbe & Swassing, 1979). James and Galbraith (1985) refer to this aspect of extracting information from the environment by the senses as a perceptual learning style. Their learning style composition is comprised of seven elements: print, aural, interactive, visual, haptic, kinesthetic, and olfactory. Research of Galbraith and James (1984) has indicated that learners do have a dominant preferred learning modality but utilize other sensory modes to extract and process information as well.

The diagnosis of the cognitive, affective, and physiological aspects of learning style can be very complex or very simple, depending on the chosen instrument. Price (1983) and Cornett (1983) have provided excellent overviews of the various learning style instruments available that can assist educators and learners in their diagnosis and assessment.

As indicated, every individual has a preferred way of processing information. On the other hand, each individual involved in the process of instruction has a dominant and preferred teaching style. A teaching style
is an identifiable set of classroom behaviors associated with and carried out by the instructor. The chosen teaching style "is the operational behavior of the teacher's educational philosophy" (Conti & Welborn, 1986, p. 20).

However, this does not mean "they cannot add to or modify that style as circumstances warrant" (Cornett, 1983, p. 28). Modification of the teaching style may contribute to a more successful experience for the learner and the instructor. The more teachers learn about their dominant teaching and learning styles as well as the preferred learning styles of their learners, the more they can provide an explanation of what is happening in the learning situation and why.

The purpose of this study was to examine the perceptual learning modalities of junior college occupational educators and how they thought they learned best and to compare this learning style preference to the teaching methodologies that were utilized in their instructional situations. In this investigation of perceptual learning style and teaching style comparison, the following research questions were formulated:

1. Is there a significant relationship between perceptual modalities and teaching methods of junior college occupational educators?
2. Is there a significant relationship between perceptual modalities and teaching methods of junior college occupational educators by related major area of study, sex, years of teaching experience, and highest educational degree attained?

One hundred thirty-six educators (n=136) from ten junior colleges in three large southwestern states participated in the study. Respondents
comprised of 32 females and 106 males. Diversity of the subjects existed in terms of age, years of teaching, and the level of educational attainment.

**Instrumentation**

A survey questionnaire was utilized to gather the data from the subjects of the study. The questionnaire consisted of three components; information of personal data, perceptual learning style preference, and teaching methods/techniques used. The personal data section asked questions concerning the major area of teaching, sex, years of teaching experience, and the highest educational degree attained. The second section was a perceptual learning style inventory developed by James and Galbraith (1984). It asked the respondents to check the strategies/techniques through which they thought they learned best. Based on their responses, they were categorized into one of seven perceptual learning modalities: visual, aural, interactive, print, kinesthetic, haptic, and olfactory. The third part of the questionnaire asked the respondents to check the methods/techniques that they used the majority of the time in their own instructional situations. Their selected methods/techniques were then categorized into seven teaching styles: visual, aural, interactive, print, kinesthetic, haptic and olfactory. This part of the questionnaire was developed by the authors using the items from the James and Galbraith (1984) inventory which were modified and translated into a list of teaching methods/techniques.

**Data Analysis**

To answer the proposed research questions of the study, perceptual learning styles were determined and ranked from the most preferred to the
least preferred for the entire group of subjects and for each individual subgroup by major teaching area, sex, years of teaching experience, and highest educational degree attained. Next, the teaching styles of the entire group and each respective subgroup were determined and ranked from most used to least used. The Spearman's rho procedure was employed to determine if a correlation existed between the perceptual learning and teaching styles, ranks for the entire group and for each subgroup. This statistical technique examined the degree to which the rank scores on the two variables were linearly related. An alpha level of .05 was selected.

Findings

The findings in Table I indicate that the learning styles and teaching styles of the 138 junior college educators were almost identical in their rank order. Only the modalities of visual and interactive had different rankings for the overall group. The modality of visual had a ranking of two for the learning style and three for the teaching style. Interactive had a ranking of three for the learning style and a two for the teaching style. All other modalities were identically ranked for both the teaching style and learning style of the subjects surveyed. Utilizing the rank orders, Spearman's rho was calculated to determine the linear relationship of the two variables ($r_s=.964$, df=6, $p<.05$). According to the finding, a very high positive correlation existed between the junior college educators in the manner in which they preferred to learn and the methodologies which were utilized in their teaching. No significant difference existed between the two variables for the overall group of junior college educators.

Table 2 indicates the Spearman's rank order correlations of perceptual learning styles and teaching styles by major teaching area, sex, years of
teaching experience, and educational degree attained. According to teaching areas, the Spearman's rho was calculated for each of the five areas of study that the junior college educators taught in.

A very high positive correlation also existed between perceived learning style and teaching style for most of the areas studied. Exceptions included: the teaching area of agriculture, educators with 21 or more years of teaching experience, and educators with high school listed as the highest educational degree attained.

References


Table 1

Rank Order of Perceptual Learning Styles and Teaching Styles of Junior College Educators

<table>
<thead>
<tr>
<th>Modality</th>
<th>Learning Style</th>
<th>Teaching Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Aural</td>
<td>4</td>
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</tr>
<tr>
<td>Interactive</td>
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<td>2</td>
</tr>
<tr>
<td>Print</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Haptic</td>
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<td>5</td>
</tr>
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<td>Olfactory</td>
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<td># of Subjects</td>
<td>Correlation</td>
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<td>----------------------------------------</td>
<td>---------------</td>
<td>-------------</td>
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<td><strong>Teaching Area</strong></td>
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<tr>
<td>Business</td>
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<tr>
<td>Engineering &amp; industrial</td>
<td>54</td>
<td>.902*</td>
</tr>
<tr>
<td>Human service</td>
<td>4</td>
<td>.839*</td>
</tr>
<tr>
<td>Health</td>
<td>13</td>
<td>.893*</td>
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<td>.964*</td>
</tr>
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<td><strong>Sex</strong></td>
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<td></td>
</tr>
<tr>
<td>Female</td>
<td>32</td>
<td>.893*</td>
</tr>
<tr>
<td>Male</td>
<td>106</td>
<td>.964*</td>
</tr>
<tr>
<td><strong>Years of Teaching Experience</strong></td>
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</tr>
<tr>
<td>0-5</td>
<td>30</td>
<td>.964*</td>
</tr>
<tr>
<td>6-10</td>
<td>32</td>
<td>.929*</td>
</tr>
<tr>
<td>11-15</td>
<td>35</td>
<td>.964*</td>
</tr>
<tr>
<td>16-20</td>
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<td>21 &amp; over</td>
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<tr>
<td>Bachelors</td>
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<tr>
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<tr>
<td>Doctorate</td>
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<td>.938*</td>
</tr>
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</table>

*p < .05
SECTION C

A Comparison of Beginning Drafting Achievement Between Students Using Traditional Equipment and Students Using Computer Aided Design and Drafting Equipment

Dennis Murphy
A COMPARISON OF BEGINNING DRAFTING ACHIEVEMENT
BETWEEN STUDENTS USING TRADITIONAL EQUIPMENT
AND STUDENTS USING COMPUTER AIDED DESIGN AND DRAFTING EQUIPMENT

By

Dennis W. Murphy
Department of Industrial Technology and Education
College of Engineering
Utah State University
Logan, Utah 84322
A Comparison of Beginning Drafting Achievement
Between Students Using Traditional Equipment
and Students Using Computer Aided Design and Drafting Equipment

Introduction

Drafting has been accomplished using very time consuming, almost artistic talents, in order to construct geometric shapes and lines that are universally understandable. Information contained in drawings has been transferred from engineer to drafter communicated to the tool maker and implemented into production. Changes or revisions to the drawings are time consuming and often require complete re-drawing of a "plate" in order to maintain clarity. Re-drawing is necessary to eliminate smudges, poor erasing and basic placement of features and dimensions.

There are certain objectives that students strive to maintain in a drafting environment. Giesecke (1984) suggests four such objectives that the student should preserve.

1. Accuracy. No drawing is of maximum usefulness if it is not accurate.

2. Speed. "Time is money" in industry and there is no demand for the slow drafter or engineer.

3. Legibility. The drafter or engineer should remember that the drawing is a means of communication to others and that it must be clear and legible in order to serve its purpose well.

4. Neatness. If a drawing is to be accurate and legible, it must also be clean; therefore, the student should develop a habit of neatness.
New computer technology has eliminated some of the problems associated with drafting. Smudging, line-density and most problems related to basic object placement are eliminated. The computer is consistent and inherently make no errors. Changes are easily accomplished using a computer drafting station. Drafting is a comprehensive, integrated decision-making process that requires many steps to completion of the final drawing. The drawing in both traditional and Computer Aided Design and Drafting are multi-step processes that are contingent upon dedication and expertise of the drafter. Then why not use only computer drafting stations?

First, computer drafting stations are expensive. They cost many times more than the equipment required to do manual drafting. Secondly, the computer drafting station requires skill and training in operation. Literacy with the CAD/D station requires the operator to learn about the hardware and software packages used in the drafting process. Thirdly, the computer drafter must still formulate many of the processes needed by the traditional drafter. Included in the process are, sketching, layout, perspective, dimension and size. A fourth element is a lack of complete Computer Aided Drafting acceptance. The questions are then asked, "Is there a significant difference achieved in drafting competencies, knowledge and skill between students using traditional drafting tools and students using Computer Aided Design and Drafting (CAD/D) tools?" Secondly, "Is there a need for CAD/D?" "CAD is revolutionizing the drafting-design field. CAD is rapidly finding its way into industry, changing the methods used to produce drawings. The basic tools are being replaced by the computer..." (Bertoline, 1985). Consequently, this study was designed to
investigate whether computer drafting tools could be as effective in teaching drafting as the manual process.

Null Hypothesis

There is no significant difference in the achievement of beginning drafting competencies between students using traditional drafting tools compared to students using CAD/D tools.

Methods and Procedures

This study compared the effectiveness of two methods of drawing in a beginning drafting class. The instructional modes consisted of a traditional drafting control group and a CAD/D experimental group. Scores on a pre-test, given during the first lab period for both groups and a post-test were given to show any losses or gains in knowledge achievement. The experiment was conducted during Fall quarter, 1986, at Utah State University. The students in both the control and experimental groups were advised as to the nature of the experiment. An identical test was administered as a pre-test and post-test. A "hands-on" final practical exam, given during the final week of class evaluated skill acquired during the final week of class evaluated skill acquired during the quarter.

Data Analysis and Findings

A pre-test given during the first lab period for the control group (traditional) and the experimental group (CAD/D) netted these results using a standard t-test.

Pre-test (figure 1)

| Number of observations in group one? | 16 |
| Number of observations in group two? | 16 |
| Mean of group one?                   | 48.69 |
A performance final "hands-on" examination given during the final testing period yielded these results:

**Performance Final Scores** (figure 2)

| Number of observations in group one? | 16 |
| Number of observations in group two? | 16 |
| Mean of group one?                   | 65.81 |
| Mean of group two?                   | 73.31 |
| Population Variance (s²) group one?  | 215.10 |
| Population Variance (s²) group two?  | 220.10 |
| Degrees of Freedom = 30              |    |
| T-test (T) is = -1.438059            |    |
| Critical T = 2.042                   |    |
| Lower Confidence Interval = -18.14977 |    |
| Upper Confidence Interval = 3.14977  |    |

A post-test, identical to the pre-test was administered during the last week of class, was given to the students to measure any drafting achievement gained during the course of the quarter. The test was also measured using a standard t-test at a .05 level of confidence.

**Post-test** (figure 3)

| Number of observations in group one? | 14 |
| Number of observations in group two? | 16 |
| Mean of group one?                   | 78.43 |
| Mean of group two?                   | 74.56 |
| Population Variance (s²) group one?  | 89.19 |
| Population Variance (s²) group two?  | 176.26 |
Conclusions and Findings

The results of the pre-test, performance final and post-tests indicate that there is no significant difference in the drafting competencies between students using traditional drafting tools and those students using CAD/D tools. All of the t-tests retained the null hypothesis and therefore we accept the findings. One interesting observation was that the students using CAD/D tools were required to learn both drafting techniques and the computer operation during the course of their study. While accomplishing this task, the experimental group maintained the same degree of proficiency as the control group. We would recommend that this study be repeated to further validate its results.

References


PRETEST GROUPS 1 AND 2 PLUS AVERAGES (FIGURE 1)

LEGEND
- GROUP 1
- GROUP 2

PERFORMANCE FINAL GROUPS 1 AND 2 (FIGURE 2)

LEGEND
- GROUP 1
- GROUP 2

POSTTEST GROUPS 1 AND 2 (FIGURE 3)

LEGEND
- GROUP 1
- GROUP 2