Profile of indicators of Industrial education and technology doctoral programs: indicators for definition and evaluation

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Profile of indicators of Industrial Education and Technology doctoral programs: Indicators for definition and evaluation

Johnson, Keith E., Ph.D.

Iowa State University, 1992
Profile of indicators of Industrial Education and Technology doctoral programs: Indicators for definition and evaluation

by

Keith E. Johnson

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Departments: Industrial Education and Technology
Professional Studies in Education
Co-majors: Industrial Education and Technology
Education (Higher Education)

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For the Graduate College

Iowa State University
Ames, Iowa

1992
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CHAPTER I: INTRODUCTION

A nationwide survey of doctoral programs in Industrial Education and Technology was conducted to establish a current profile of these programs. No such profile exists.

Industrial Education and Technology departments are confronted with several issues including a lack of funding and a shortage of qualified faculty. Also, many graduate students drop out of doctoral programs because of a lack of funding and other support services. These are clear and immediate problems, but most previous studies have concentrated on the history and development of doctoral programs in this field.

Some scholars have been concerned with the lack of consensus on issues such as the definition of technology education. However they have limited their actions and recommendations to lack of a consensus (Luftig, 1981). Technology changes so rapidly that most research focusing on Industrial Education and Technology tends to be in the aforementioned area.

Research efforts have been minimally directed at the history of the field. Wolansky and Resnick (1982), Wolansky and Miller (1981), Hayes and Vesely (1970), and Luftig (1981) conducted such research. These studies contribute to the knowledge base but in a rapidly changing field, it may be of more practical importance for scholars to determine
the current status of the field and where it seems to be headed rather than to asking where it has been. The present study is necessary, and is worth doing, because it will provide current information on the student population concerned. In this respect, it differs from discussions of educational models and field definition (Luftig, 1981) and long-term trends (Wolansky, 1989). Wolansky and Resnick (1982) assessed selected components of Industrial Education and Technology doctoral programs to establish patterns and identify emerging trends or recurring problems over a fifty-year period. They found no significant difference between the Ed.D. and Ph.D. programs and recommended a follow-up study focusing on the qualitative distinctions among programs. Institutional matters such as "magnet" professors, faculty expansion, and funding are important concerns, but even the authors of such studies suggest that follow-ups are necessary to establish patterns or identify emerging trends and recurring problems (Wolansky and Resnick, 1982). In fact, this study was suggested as a direct follow-up of previous work by Wolansky (Wolansky, 1991).

Wolansky (1989) stated that a professional consensus on criteria that describe quality indicators at the doctoral level is needed. Kovac (1985) stated there is a void in follow-up of doctoral students, which limits the information
available to determine employment opportunities and characteristics.

It is anticipated that this survey conducted as a part of this study will provide information on student characteristics and network support for doctoral students in Industrial Education and Technology. In the proposed study, factors of quality will be examined to gain insight about current trends and to extrapolate future ones.

Need for the Study

The professional literature in Industrial Education and Technology has been concerned primarily with history and field definition. Discussion of issues which impact quality of doctoral programs are absent from the literature, however, the following articles all suggest the need for this study.

Expectations of industry and business require technology education beyond the Bachelor of Science degree. Because technology changes, new programs evolve to satisfy the needs of students pursuing graduate work to enhance their prospects for employment in industry and business. Graduate work in Industrial Education and Technology becomes an important issue because it establishes rank, salary, and technical competence (Hayes and Vesely, 1970). In the real world, the dynamics of change in technology requires
periodic redefinition of technology education. Thus, it is even conceivable that earlier assessments of the problem are part of the problem.

Luftig (1981) briefly examined career options, but neglected to delve deeper into them as they are related to quality of doctoral programs. Career options, had he examined them more closely in such a context, may have been the significant substance of his paper, i.e., profiles, career choices, etc. His primary concern was with educational models but, in a practical sense, the career options available to the candidates are more important than educational models because they can provide the base for subsequent field experiences as a part of the doctoral program.

Wolansky and Miller (1981) also recommended a study to develop indicators which could be used to assess doctoral programs. Kovac (1985) asserted that follow-up studies in Industrial Education are useful for recruitment and placement purposes but said that such studies have been limited.

Statement of Problem

There has been a continuous call in the literature for the need to research quality indicators of doctoral programs in Industrial Education and Technology for the past two
decades. While many research studies were devoted to the quantification of demographic variables of doctoral students, number of credits required in specific areas of the curriculum, years of continuous study to complete the degree, number of volumes in the library, and ratio of graduates entering various career options of teaching, administration or other fields, there has been less effort directed by researchers to conduct studies which examine quality indicators of doctoral programs in Industrial Education and Technology.

This study is designed to investigate two quality indicators of doctoral programs in Industrial Education and Technology. These are:

a) Student characteristics; and

b) Network support

Purpose of the Study

This study was designed to investigate the perceptions of doctoral students for definition and evaluation of quality indicators in Industrial Education and Technology nationwide. These survey results will help identify the needs of the current population and may predict near-future trends in recruiting students. The results may also help to justify some changes within the programs, i.e., curriculum, internships, the seeking of corporate sponsorship, and the
division of labor among the faculty. It may help rank the importance of research topics (career development, etc.). The survey results should be important in the advising of doctoral students during their degree programs.

Rationale for the Study

Wolansky and Resnick (1982) performed a preliminary survey but with a limited sample. No effort has been made to survey a larger cross-section of Industrial Education and Technology doctoral programs, even though the number of programs in this field is relatively small according to Dennis (1991). Only forty-two departments in Industrial Education and Technology offer the Ph.D. degree program.

Wolansky and Resnick performed their study approximately ten years ago. The student population, the courses taken in the program and subject matter that the students are taught have changed markedly. For example, personal computers were not used until the mid-1980s.

One intent for this study is to update and expand upon the Wolansky and Resnick study by also examining support services. Other reasons which are perhaps more important are to verify trends relative to student characteristics and their impact on graduate school recruitment and to account for curriculum changes within the departments. This need is supported by the current decline in graduate student
enrollment and financial support nationwide. The nationwide trend suggests a loss of Industrial Education and Technology professors to business, hiring freezes, and the need for business to retrain personnel and adapt new methods to be competitive in the marketplace (Luftig, 1981).

The survey proposed here differed from the earlier Wolansky and Resnick survey because it aimed at sampling a larger proportion of doctoral programs than was done in the earlier study. It is expected that the larger number of students in the entire doctoral population will generate a larger number of responses, making it possible to describe more precisely the status of doctoral students in Industrial Education and Technology nationwide and to generate a profile of indicators of doctoral programs.

A description of a representative sample of doctoral students in this field will contribute to an improved understanding of the essential needs of all current doctoral students in Industrial Education and Technology. The survey used in this study was aimed at identifying indicators for assessing the program quality as perceived by doctoral students with their institution, the adequacy of their funding, their previous experience and their post-degree aspirations.
Research Design

Surveys are a traditional method of gathering information at a minimum cost to the researcher. The survey method is the most efficient tool available to the social scientist interested in collecting data in large populations (Babbie, 1986). The advantages of a self-administered survey are economy, speed, lack of interviewer bias and anonymity.

The research design includes a direct mail survey to the students. The survey contained 100 total responses, of which 89 were directed towards the students and 11 were directed to Department Executive Officers of Industrial Education and Technology departments. Surveys were mailed to students and DEO's individually with self-addressed stamped envelopes for return. Survey responses remained anonymous, which was expected to lead to a more honest response than a survey that is passed out and collected by department heads. Surveys were mailed to all programs having two or more doctoral students graduating in the program during the previous academic year (Dennis, 1990). To enable this researcher to reduce a large number of variables to a smaller number of statistically independent variables (factors), the Factor Analysis Technique was utilized.
Quality Measures

Quality measures were developed by the researcher through pilot testing at Iowa State University in the Industrial Education and Technology Department. Nine areas of study were developed through the pilot test by the students at Iowa State University, the written literature (Brownlee, 1975; Cooper, 1990; Davis, 1972; Girves, 1988; Howe, 1988; Ray and Ravizza, 1985; Smith, 1990; C&EN, 1982; University of Northern Iowa, 1978), Dr. William D. Wolansky (the researcher's major professor), and the researcher. Factor analysis yielded factors that were utilized for assessing quality measures. These factors are discussed in detail later.

Research Questions

The survey was designed to disclose answers to questions derived from previous literature (Cole, 1972; Dillman, 1978; Glock, 1967; Hyman, 1955; Kish, 1965; Kohr, 1970; Lazarsfeld, 1955; Rossi, 1983; Sudman, 1982) and the researcher's experience as a doctoral student in Industrial Education and Technology at Iowa State University.

The research questions that guided this study are:
1. What is the general profile of current doctoral students nationwide?
2. What are the doctoral students' career goals?
3. What are the doctoral students' recommendations for program improvements?

4. What, if any, trends can be identified from survey responses in terms of:
   (a) population of doctoral students;
   (b) sources of support.

Student Quality Indicators

Section I – Student Characteristics

"Student characteristics" refers to the Industrial Education and Technology doctoral students' undergraduate g.p.a., graduate g.p.a., publications, books, articles, and funded grants.

It was hypothesized that some relationship would exist with students' grades (undergraduate and graduate) and the students' level of satisfaction. It was further hypothesized that some relationship would exist with students' professional activities and their level of satisfaction. These hypotheses are more formally stated below:

(1) there is a positive relationship between undergraduate G.P.A. and student levels of satisfaction.
(2) there is a positive relationship between graduate G.P.A. and student levels of satisfaction.
(3) there is a positive relationship between professionally
active students and student levels of satisfaction.

Section II - Network Support

"Network support" refers to financial assistance (i.e., scholarship, self, corporate, institutional, military, and/or family support, loans, research assistantships, teaching assistantships, or involvement in an intern or extern program).

It was hypothesized that some relationship would exist with students, sources of financial assistance and students' level of satisfaction. These hypotheses are more formally stated below:

1. doctoral students will feel positive about having outside assistance.
2. a negative response will prevail when there is only self support.
3. a positive response will prevail when there is corporate support.
4. a positive response will prevail when a respondent has a teaching or research assistantship with institutional support.
5. a positive response will prevail when a respondent has scholarship support.
6. the relationship will be indeterminate when loans are the primary source of support.
the relationship will be positive when the military is the source of support.

(8) the relationship will be indeterminate when the family is the major source of support.

(9) the relationship will be positive when there is an opportunity for an intern/extern.

Assumptions of the Study

The following assumptions were made during this study:

(1) the survey instrument was a valid measure of indicators and student characteristics, (2) the pilot test of the survey represented an adequate test of the instrument, (3) the survey respondents answered the survey questions honestly, (4) peer evaluation was a valid and reliable indicator of quality (Edwards, 1979) and (5) the responses represented an adequate sampling of the current doctoral students in Industrial Education and Technology programs nationwide.

Research Delimitations

The following limitations were imposed: (1) the respondents will be Ph.D. degree doctoral students in Industrial Education and Technology only, (2) the results of this survey apply to this study only and should not be generalized beyond the sample, and (3) the study is limited
to Ph.D. programs in Industrial Education and Technology where the department has had at least two or more students who graduated during the previous year to this study.

Definitions of Terminology

1. "Doctoral students" refers to students who have been successfully admitted to the Ph.D. program in Industrial Education and Technology at their particular institutions.

2. "Student characteristics" refers to the Industrial Education and Technology doctoral students' undergraduate g.p.a., graduate g.p.a., publications, books, articles, and funded grants.

3. "Network support" refers to financial assistance (i.e., scholarship, self, corporate, institutional, military, and/or family support, loans, research assistantships, teaching assistantships, or involvement in an intern or extern program).
CHAPTER II: LITERATURE REVIEW

Introduction

The purpose of the review of literature is to summarize the previous research results related to this study. In most areas of education, there is an abundance--perhaps even an excess--of professional literature. In the area of technology education doctoral programs, however, the literature is much more limited. Consequently, this review will address a limited number of studies that have suggested the need for the type of study being performed.

The studies of most value to this researcher were performed by Luftig (1981), Wolansky (1989), Wolansky and Resnick (1982), Wolansky and Miller (1981), Hayes and Vesely (1970), and Kovac (1985). These studies addressed the major objective for doctoral level programs in Industrial Education and Technology (IEDT).

Overall, the concerns of the researchers listed above could be summarized as historical development of the field (Wolansky and Miller, 1981; Hayes and Vesely, 1970) and definition of the field (Luftig, 1981). Other concerns have included program growth, funding, and sustained quality, (Wolansky, 1989) and the recruitment of students and placement of graduates (Kovac, 1985). Also, the need for follow-up studies was addressed by Kovac (1985), who stated that there was a "void" in follow-up of doctoral graduates.
The relatively small amount of literature has been characteristically historical. This has had the effect of obscuring the problems that departments face in reaching consensus on the criteria that describe quality indicators at the doctoral level in Industrial Education and Technology programs. It has also left a void of current information about student characteristics and their needs.

The studies identified above are examined in some detail below. Overall, they lead to the perceived need (as shown in the literature) for a study of the field's present and anticipated future direction.

Industrial Education and Technology Studies of Interest

In the studies examined, emphasis was given to field definition, educational models, overall history of the field, and the stages of development and growth found in academic departments and settings.

Theoretical issues

Moss (1974) outlines several theoretical issues concerning Industrial Education and Technology, the most important of which are:

(a) Where should the goals of doctoral programs emanate from, the needs of the students or the needs of the field?

(b) Should doctoral programs certify quality based on
experience provided or competencies attained?

(c) Should the educational process be activity oriented or should it be designed to emphasize intellectual inquiry?

Moss (1974, p.87) argued that: "Program strength, therefore, lies in the institution's capacity to respond quickly and relevantly to the varied needs of persons who wish to utilize its resources."

Buffer (1979) made no attempt to evaluate specific Industrial Education and Technology graduate programs. However, overall, he contends that the profession can be maintained, improved and expanded through continued self-monitoring and evaluation.

Buffer envisions the American Council on Industrial Arts Teacher Education as an oversight agency that develops policies and standards for graduate programs. Criteria developed by such an organization allow individual departments to monitor and evaluate their programs as a form of self-evaluation. The results of self-evaluation may be used by external reviewers to provide an objective analysis of said programs.

Educational models

Luftig (1981) stated that there are two educational models presently used in Industrial Education and Technology
programs. These were:

1. Technology-based programs

2. Industrial technology

An industrial technology program may be described as a subdiscipline and an independent content area for study, but not necessarily to the exclusion of any of the other technological areas. A technology-based program may be described as one which encompasses all systematic, disciplined approaches to achieve any objective which requires precision, measurement, and a systems approach. Buffer (1979) said that the future thrust in the area of evaluation will help to improve program offerings, the professional preparation of educational personnel, and the integrity of the graduate major in Industrial Education. In Buffer's view, it was more important to support demonstrably excellent programs than it is to provide more programs in need of support. Previous literature suggests the need for such an approach (Carns, Poland and Wilson, 1978). Lux (1974) agreed with Buffer that a basic mission statement founded upon an agreed criterion should be established. Without a mission statement, departments and scholars have no basis to judge performance levels within a doctoral program. The apparent success of previous graduates is the only evaluation of the program that exists today (Evans, 1974).
Field definition

Luftig (1981) presented a frame of reference for discussion of technology-based programs of graduate study. Citing Streichler and Ray (1971), Luftig indicated that an acceptable definition of the field is elusive if not impossible, and asserts that a definition would be helpful in developing a theoretical structure as well as planning new curricula.

Selection of doctoral students

Evans (1974) reported two methods of doctoral program entry, (1) open door and (2) careful screening of students.

Evans' most notable statement is that when a professor accepts a doctoral advisee, he or she accepts an implicit moral responsibility to assure that the student completes the program and finds a satisfactory job.

Overall history

Industrial Education and Technology graduate programs are only about fifty years old (Wolansky, 1989). Hayes and Vesely (1970) placed the development of Industrial Education and Technology programs within the context of graduate programs in general and gave an overview of the history of such programs asserting that the establishment of the land grant college was the most influential single factor to
affect graduate programs in Industrial Education and Technology.

Technology required education beyond the B.S. degree to meet the needs of industry and business (Hayes and Vesely, 1970). Hayes and Vesely (1970) also state that new programs are constantly evolving to satisfy the needs of students who want to pursue graduate work to enhance their background for industrial pursuits. Hayes and Vesely identified graduate work as being important because it establishes rank, salary, and technical competence.

Wolansky and Resnick (1982) provided a historical overview of Industrial Education and Technology doctoral programs over the last fifty years. The intent of their research was to identify the differences between the Ed.D. and the Ph.D. programs, if any, and to compare pre-1965 programs with post-1965 programs. The year 1965 was chosen as a point of demarcation because recent graduates represented an important component of the sampling process. A large number of universities initiated doctoral programs around this time in anticipation of funding being made available by the Education Professional Development Act.

In a paper comparing Industrial Education and Technology doctoral programs before and after 1965, Wolansky (1989) observed that the 1980's brought about deteriorating economic conditions: retiring professors were not replaced,
programs were eliminated, and many faculty members left their departments to pursue careers in other areas.

In the same paper, Wolansky reported there was a lack of commitment to researching the causes of the decline and termination of doctoral programs and recommended that departments design more responsible and flexible programs to attract able students. He also recommended that some professional consensus on the criteria describing quality indicators at the doctoral level in Industrial Education be sought.

**Stages of development and growth**

The main study dealing with institutional structure or stages of development and growth was conducted by Wolansky (1989). In this study, Wolansky reports that it may be difficult or challenging to retain quality doctoral programs in industrial education. In fact, simply keeping a quality program is a challenge that departments face.

Wolansky mentioned there are three stages of development and growth in quality doctoral programs in Industrial Education and Technology. These are the "magnet professor," the expanded faculty/research team, and the funding stages. These stages are described below:

1. **Magnet Professor:** In the 'magnet' professor stage, a professor with a prominent reputation
draws the top-notch candidates to the school.

2. **Expanded Faculty/Research Team:** In the 'expanded faculty/research team' stage, the faculty is enlarged and divided into small teams having specialized research interests.

3. **Funding:** In the 'funding' stage, the institution receives external support through the U.S. Office of Education.

Due to cuts in educational funding in the 1980's, Luftig (1981) predicted that few institutions at the doctoral level would have the facilities to actually have hands-on training of doctoral students. Therefore, in Luftig's view, the meaning of technical skill at the doctoral level must be redefined—the candidate must acquire not only research skills but also acquire field experiences. Practically, however, study in the technology-based programs offer career options for the candidates. The career options are most important to the doctoral candidate.

Wolansky and Miller (1981) reported that fewer than ten institutions in the U.S. offer work leading to the doctorate in Industrial Education and Technology have adequate facilities.
Focus of previous studies in Industrial Education and Technology

Surveys by Wolansky and Miller (1981) and Wolansky and Resnick (1982) have established that there are no significant differences between Ed.D. and Ph.D. programs. They have also established that there were no significant differences between programs founded before and after 1965.

Wolansky and Miller (1981) stated that the five objectives of their study were: (1) to identify differences between the Ph.D. and the Ed.D. in Industrial Education curricula; (2) to identify differences in programs before and after 1965; (3) to identify patterns in student characteristics and program involvement within the Ed.D. and Ph.D.; (4) to compare characteristics before and after 1965; and (5) to note the problems and the successes encountered by academic department leaders in the administration of doctoral programs. Objective five involved characteristics of (a) student evaluation; (b) institutional evaluation; and (c) program deficiencies and successes.

The greatest value of Wolansky and Miller's survey was in revealing (a) placements of graduates; (b) whether the institutions provided working internships; and (c) whether the students felt they were working with quality faculty. The survey also revealed that (a) support money was felt to be inadequate; (b) hiring of additional faculty was on the
decline; and (c) expansion of facilities had come to a standstill. The survey also indicated that older department administrators believed their programs were of sufficient scope and substance while the administrators of the newer departments did not.

In a related survey, Wolansky and Resnick (1982) assessed selected components of Industrial Education doctoral programs to establish patterns and identify emerging trends or recurring problems. Their five major objectives were: (1) to ascertain discernable differences between Ed.D. and Ph.D. programs; (2) to establish differences between programs founded before and after 1965; (3) to identify differences in student characteristics in Ed.D. and Ph.D. programs; (4) to determine if there were discernible differences in programs before and after 1965; and (5) to identify problems and achievements in the administration of doctoral programs as perceived by the departmental executive officers in Industrial Education and Technology.

Wolansky and Resnick surveyed departmental executives, recent graduates, and current degree candidates in Industrial Education and Technology. Data were collected in five areas: vital statistics, curriculum preferences, student involvement, research and program options.

The Wolansky and Resnick survey revealed that the
typical candidate for a doctoral degree had 7-11 years of teaching experience and between 1.5 and 6 years of administrative experience. Their survey results also showed that (1) no significant differences were found between Ed.D. and Ph.D. programs; (2) no significant differences were found in programs before and after 1965; (3) students within Ed.D. and Ph.D. programs followed similar paths; (4) chairs perceived current candidates more favorably than did their counterparts from a decade ago.

On the basis of this survey, Wolansky and Resnick suggested a follow-up study on the quality indicators among programs in Industrial Education and Technology.

Trends and emphases in graduate education for Industrial Education and Technology

Wolansky and Miller (1981) stated that graduate studies in Industrial Education should be the topic for a periodic study. They recommended five actions:

1. Seek support for a study to develop quality indicators which could be used to assess doctoral programs.

2. Follow-up graduates who have become researchers.

3. Follow-up graduates to identify program attributes essential to the development of administrators.

4. Replicate the study within five years with
improved instrumentation and statistical analysis.

5. Refine existing instrumentation with emphasis upon quality indicators.

Kovac (1985) brought attention to the usefulness of the materials provided by the follow-up studies and asserts that such studies are useful for recruitment and placement purposes. However, he goes on to state that these studies have been limited and there is a void in follow-up of doctoral degree graduates. Consequently, there is little or no information with which to interpret employment opportunities for and employment characteristics of these graduates. Kovac stated that he wishes to study the doctoral candidates after they have graduated and then to use the information found for career purposes (between the years 1980-1983).

**Curriculum planning**

Hayes and Vesely (1970) proposed an overall plan for curriculum planning to include advanced or state-of-the art technology, technical management, and business and business management courses. Results from their survey indicate there is a need for such programs. They suggest that graduate departments in Industrial Education and Technology nationwide stay in communication with each other and encourage the adoption of such programs. Finally, they
state that departments should adopt an interdisciplinary approach.

Issues

The literature has identified issues facing Industrial Education and Technology Departments nationwide. Currently, the issues seem to be career options and choices, funding, decline in Industrial Education and Technology programs, enrollments, and quality. The non-issues, by contrast, include exaggerated concerns for definition, the difference between Ed.D. and Ph.D., educational models, stages of growth, and field history.

Career options and choices

The primary issues involved with career options and choices are recruitment, placement, and follow-up studies of graduates. Wolansky and Resnick (1982) and Wolansky (1991) have suggested the need for a follow-up study of career options using qualitative research methods. Wolansky and Miller (1981) suggested that a period about five or ten years after their 1981 study would be "an opportune time" for a follow-up study that tracks graduates who became researchers and administrators. Kovac (1985) reports a void in a follow-up of doctoral degree graduates, so there is little or no information with which to interpret employment
opportunities for, and employment characteristics of, these graduates. Hayes and Vesely (1970) also suggest that having such information is helpful in better estimating professional rank, salary, and technical competency of holders of advanced degrees. For the better understanding of current career options, the survey developed for this study is needed.

Funding and money

Financial support for departments and students, facilities, hiring and replacement of faculty, and internships are primary issues. Wolansky (1989) observed the total number of doctoral programs in Industrial Education and Technology in the U.S. has experienced a steady decline since the early 1980s, with absence of funding being a major reason. The educational "boom" of the mid-sixties allowed for expansion of programs (Wolansky and Resnick, 1982) but the "bust" of the 1980s and 1990s has caused a steady decline in funding to support quality programs.

Program decline

Departmental adaptation to changing conditions, trends, and curriculum development and planning are primary issues. The absence of funding does not allow for upgrading of
equipment; it also prevents hiring staff to replace retiring professors, prevents the hiring of magnet professors because programs are in decline, and causes grave concerns for curriculum development: what should be taught, by whom, with what, and how.

**Traditional vs. non-traditional approaches**

Research, faculty, internships, equipment, students, student funding, ideas on industry and corporations are primary issues. Hayes and Vesely (1970) stated that traditional approaches neither foster the philosophy of industrial education nor encourage adoption of interdisciplinary approaches to education and technology. Instead, they asserted that traditional approaches to education may hamper growth and development because such approaches limit thinking and action to what was done in past decades (1970, p. 33). There is a place for "replicate studies" in research, but researchers should not be so busy reproducing the past that they ignore the present and future.

**Need for quality indicators study**

The decline of programs and funding, the uncertainty as to what should be taught and learned, the career placement of graduates, and the current support of departments,
faculty, equipment, and students all suggest the need for a quality indicators study. The limited amount of literature and research available has had the effect of obscuring significant issues faced by departments in reaching consensus on the criteria describing "quality" indicators. Wolansky (1989) recommended that some professional consensus on the criteria that describe quality indicators at the doctoral level in Industrial Education be pursued by scholars and advanced graduate students in the field.

Summary

Issues on which consensus has been reached include differences (if any) between Ph.D. and Ed.D. students, and history and/or growth of the field. Certain areas are, and probably will remain, unsettled. It may be that a permanent definition is impossible because technology constantly changes; it is certain that educational models will change with time and research findings.

This chapter provided a review of past research and publications related to the characteristics of doctoral programs in Industrial Education and Technology. The emphasis has been on delineating quality issues as discussed in past research.

The study describes present characteristics of doctoral student support, institutional facilities, and career
aspirations and choices as perceived by the doctoral students. Improved knowledge of these "quality indicators" will aid institutions of higher learning in interpreting career placement, rank, salaries, recruitment, and advising for Industrial Education and Technology doctoral students. It will also assist institutions in curriculum planning for a changing industrial and technical environment. The information gained by this survey will be of use to other researchers at universities nationwide for several years to come.
CHAPTER III: METHODOLOGY

The methods and procedures used in this study are described in this chapter and reported in six parts:

1. Description of survey research.
2. Description of the survey instrument.
3. Development of the instrument.
4. Definition of the population studied.
5. Method of data collection.
6. Method of data analysis.

Description of Survey Research

*The Practice of Social Research* is a well-known introductory text in the social sciences by Earl Babbie (4th ed., 1986). Babbie's discussion of survey research was chosen for use in this dissertation because it was complete and brief, and included factors that led to an easy summary and paraphrase.

Survey research is a time-honored method of gathering data in the social sciences, of which education is one. Babbie (1986, p.235) writes that "survey research, a popular social research method, is the administration of questionnaires to a sample of respondents selected from some population." He considers surveys to be "especially appropriate for making descriptive studies of large populations" but notes that "survey data may be used for
explanatory purposes as well (p. 235)." The chief advantage of survey research is that a large amount of reasonably standardized data can be collected for a relatively low cost when questionnaires are administered to respondents (p. 236). Standardization is important because it is necessary for the researcher to know that all the respondents are answering the same questions. The major weakness of survey research is that questionnaires may seem somewhat artificial and superficial (p. 236).

Babbie mentioned that survey questionnaires may be administered in two ways: self-administered questionnaires and interviewer-administered questionnaires. Self-administered questionnaires are completed by the respondents themselves. Interviewer-administered questionnaires are administered by interviewers, who read the items to respondents and record the answers.

Researchers who utilize the mail method have no way of determining nonrespondent characteristics, because they make no personal contact. The ability to determine nonrespondent characteristics is good for the face-to-face interview, intermediate for the telephone interviewer, and poor for the mail survey (Dillman, 1978).

In general, interview questionnaires are expensive and time-consuming to conduct, especially if a researcher is dealing with a large population scattered over a large area.
Self-administered questionnaires are relatively inexpensive and fast. How far into the past or how deeply into the unconscious the search should go will depend on the purpose of the survey and its budget (Zeisel, 1957). The cost of duplication and mailing are financial considerations and the length of time required is controlled by how long it takes the respondent to answer the questionnaire and return it. "Every researcher who chooses the mail questionnaire should consider the majority of respondents will probably not complete and return the questionnaire (Miller 1983)."

For these reasons, self-administered questionnaires are the most common and popular form of survey research. Besides economy and speed, self-administered questionnaires offer advantages in the lack of an interviewer bias and in the possibility that anonymity and privacy in making responses will encourage the people surveyed to respond more candidly on sensitive issues.

Some limitations must be recognized in order to utilize the findings of this study. These are:

1. The study was limited to doctoral students enrolled in Industrial Education and Technology doctoral programs in the United States. In other words, doctoral students in other programs or other countries were not studied.

2. The questionnaire was developed specifically for this study. While it seems to have worked reasonably well
in gathering the information it was intended to gather, and the factor analysis tends to validate it as a construct, it has not been subjected to extensive and repeated tests of reliability.

Description of the Survey Instrument

The survey instrument, or questionnaire, was constructed to include a number of open-ended and close-ended questions. Open-ended questions are typically "fill-in" items. Their purpose is to gather data. "What do you think of ...?" is an example of an open-ended question. Close-ended questions are typically "forced choice" items or measures of agreement. Close-ended questions can be either quantitative or qualitative based on the researcher's intent. When the question "Did you work this week?" can only be answered "Yes" or "No," it is a "forced choice" type of close-ended question (it forces the reader to choose between two alternatives). Close-ended questions can also be used as measures of agreement when the respondent is required to choose one of several answers. The most common format of the "measure of agreement" type of close-ended question is the Likert scale or attitude survey type of instrument.

Likert-type scales can also be used to establish and quantify ratings. For example, this research employed a
form in which the respondents rated their schools as follows:

"The school has lab facilities."

Select One:

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Poor</th>
<th>Fair</th>
<th>Very Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

where the scoring would be as follows:

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Poor</th>
<th>Fair</th>
<th>Very Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Babbie wrote that every variable in research should be both "exhaustive" and "mutually exclusive." For a variable to be exhaustive means that the researcher should be able "to classify every observation in terms of the attributes composing the variable" (Babbie, p. 120).

Construction of the survey instrument involved developing questions whose answers were both exhaustive and mutually exclusive.

Development of the Instrument

A questionnaire was developed for the gathering of the
necessary data for the study. The headings, sub-headings and items were generated by the researcher from an investigation of the literature (e.g. Wolansky and Miller, 1981; Wolansky and Resnick, 1982; and Wolansky, 1989). The instrument consisted of directions for choosing the appropriate choice, headings, sub-headings, and items. The Likert procedure was adopted for the purpose of having a relatively simple means of entering the data collected (entering the data into Lotus 123 and turning the Lotus data into a 'text file') and thus having the ability to convert the data into computer acceptable language (S.A.S. [Statistical Analysis System] at Iowa State University).

Research Sample

The programs to be surveyed were selected from listings in the Industrial Teacher Education Directory (1990-91, 29th ed.). A pilot study was field tested with doctoral students in Industrial Education and Technology at Iowa State University. The survey was then modified slightly according to the comments of the students.

Validation and Pilot-testing of Instrument

The final draft of the instrument was pilot-tested with a sample of doctoral students in Industrial Education and Technology at Iowa State University in March 1991. The
results of the pilot test were further utilized by the researcher to screen and revise the instrument.

Data Collection

In order to help facilitate the mailing of the instrument for the collection of the data, it was necessary to identify a contact person in the thirteen Industrial Education and Technology departments nationwide that would assist the researcher in the administering of the questionnaires. The researcher enclosed stamped self-addressed return envelopes so it was not necessary for the contact person to gather the responses. It was intended that the respondents would keep their anonymity by direct return mail of the questionnaire to the researcher. A copy of the survey instrument is presented in Appendix A of this dissertation.

In March 1991, the Departmental Executives Officers of Industrial Education and Technology departments nation-wide were sent informational packets that consisted of a cover letter, a brief questionnaire to the D.E.O's, and the stamped self-addressed envelope and questionnaire for the doctoral students.

The questionnaires were mailed on March 20, 1991 to the D.E.O.'s as the designated contact persons. Each respondent was asked to return the completed questionnaire as soon as
possible and not to exceed 30 days. Although the respondents were allowed 30 days, the researcher allowed for 60 days for the data to be returned.

Close-ended questions and open-ended questions were utilized in the survey instrument. Close-ended questions provided a greater uniformity of responses. Consequently, the open-ended questions were eliminated from the main part of the study, however, they are synthesized and reported in Appendix C. Close-ended responses allowed for the responses to be entered directly from the questionnaire into a text file in order to be compatible with the SAS package. The questions, thus, were constructed so that they were exhaustive (all responses that might be expected) and mutually exclusive (the respondents should not feel compelled to select more than one response).

It should be noted that the uniform scoring of the Likert-item response categories assumes that each item has about the 'same intensity' as the rest. As the design meets the criteria of collecting standardized information from or about a sample representative of a universe, it falls within that category of design which we shall call the basic survey design (Glock, 1967).

Data Analysis

A survey instrument was used to collect data. The
survey instrument was designed in such a way as to elicit very specific data and to eliminate any extraneous information which was not relevant to the research questions. The methodology delineated for this study was considered appropriate and feasible within the time and fiscal constraints imposed upon the researcher. The grouping of items in the survey instrument enabled the researcher to create appropriate factors which did facilitate coding and factor analysis (the statistical method used for running and analyzing the data).

**Factor Analysis**

Factor analysis was utilized to transform the independent variables to a smaller set of factors (Rosenberg, 1968).

**Factor model**

There are k variables x1, x2, .... xk on which it is possible to measure and analyze the sample. The factor analytic model expresses the mean of each of these k variables in terms of a linear function of m statistically independent artificial variables called factors (Agresti and Finlay, 1986). The following are the nine topics which will be measured:

1. institutional capacities
2. relationship of students with faculty
3. institutional support
4. financial assistance
5. program information
6. course work
7. financing and funding
8. career options
9. forecast

**Two stages of factor analysis**

Factor analysis involves two stages, extraction, and rotation.

1. **EXTRACTION** [principal components] the procedure with which the ten factors were decided.

   Extraction explains that there is an average amount of variance in all the variables taken together.

   Ten combinations of variables were extracted. It helped to understand how variables are related to one another.

2. **ROTATION** [varimax]

   This statistical procedure provides a closer fit of variables to these ten factors...making it more nearly certain where every variable belongs (provides a simple structure). The threats were minimized as students returned their results directly to the researcher. Confidentiality and anonymity were protected by utilizing group analysis.
Factor analysis is useful for establishing a typology and provides an efficient method for discovering predominant patterns among large numbers of variables. It is useful for discovering patterns among values of several variables because it generates "artificial dimensions" or factors correlating highly with real variables but independent of one another (Babbie, p. 435). It also presents the data in a form that can be interpreted by the reader or researcher.

Two criteria define a factor. These are (1) a factor must explain a relatively large portion of the variance found in study variables; and (2) every factor must be more or less independent of every other factor (Babbie, p. 435). What this means, in practice, is that a factor is essentially a category. In keeping with the categorical language used earlier in this dissertation, the basic characteristics of a category are that it is both "exhaustive" and "mutually exclusive."

Data analysis

Factor analysis was employed for the purpose of reducing the complexity of the large number of survey items in which students evaluated the perceived quality of their programs. Ten factors were derived from these items. Factor 1 consisted of all or most of the items on the questionnaire that dealt with lab facilities. Each factor
would have to be similarly described. The procedures outlined by Agresti and Finlay (86), pp. 514-517 were followed.

This procedure provides some measure of construct validity. All of these validated constructs (i.e., the factors) were then used in subsequent correlational analysis. One set of data dealt with how these derived factors of program quality were related to student quality characteristics (undergraduate GPA, graduate GPA, and professional activity). The second set of data examined relationships between the measures of student quality, and networking systems.
CHAPTER IV: FINDINGS

This study was designed to investigate the quality indicators of doctoral programs in Industrial Education and Technology nationwide. The term ‘student characteristics’ will refer to undergraduate g.p.a., graduate g.p.a., and professional activities. The term ‘network support’ will refer to outside assistance, self-support, corporate sponsorship, institutional support (RA/TA), scholarships, loans, military, family, and intern/extern.

Results of hypotheses testing and other major findings of the research are presented in this chapter. The researcher developed nine items, presented below:

1. institutional capacities
2. relationship with faculty
3. institutional support
4. financial assistance
5. program information
6. coursework
7. financing and funding
8. career options
9. trends

Four research questions which formed the bases for this study are presented, followed by the appropriate data reported in frequencies, percentages, mean ratings, chi-square values and correlation coefficients.
Data collected for this study were analyzed in relation to the four research questions.

Interpretation of the analyses yielded answers to the following research questions:

1. What is the general profile of current doctoral students nationwide?
2. What are the doctoral students' career goals?
3. What are the doctoral students' recommendations for program improvements?
4. What, if any, trends can be identified from survey responses in terms of:
   (a) population of doctoral students;
   (b) sources of support;

From these questions, and the clustering effect of the factor analysis, two hypotheses were derived and tested. These were:

1. There is no relationship between student quality measures and their perceptions of the quality programs they are in.

2. There is no relationship between student perceptions of networking systems and student perceptions of the quality of the program.
Hypothesis Testing

The results of hypothesis testing were as follows:

1. There is no relationship between student quality measures and their perceptions of the quality programs they are in.

2. There is no relationship between student perceptions of networking systems and student perceptions of the quality of the program.

Characteristics of the Respondents

The population of this study included only doctoral students from industrial education and technology programs nationwide. The sample consisted of 210 students. The population was defined by telephoning departments identified in Industrial Teacher Education Directory, 1990-91, 29th edition, which provided telephone contact numbers and identification of department chairs in Industrial Education and Technology programs nationwide. Participating institutions had to have a minimum of two doctoral students who graduated the previous year. A total of 65 questionnaires (30.1%) were returned useable and, therefore, were coded and analyzed. Dr. Mack C. Shelley, Professor of Statistics and Political Science at Iowa State University, (1992) suggests that the survey response percentage (30.1%) was adequate in terms of an overall return rate. Dillman
(1978) and Babbie (1986) suggest the same.

Restated in null hypothesis form:

1. There is no relationship between student quality
   measures and student perceptions of the quality
   programs they are in.
   
   student characteristics
   undergraduate g.p.a.
   graduate g.p.a.
   professional activities

2. There is no relationship between student
   perceptions of networking systems and student
   perceptions of the quality of the program.
   
   network support
   outside assistance
   self support
   corporate support
   institutional support
   scholarships
   loans
   military
   family
   intern/extern

Although a pilot test had indicated the survey
instrument was a measure of the research items of interest,
the first analytic concern was in validating the study. Factor analysis, a complex algebraic method for determining the general dimensions or factors that exist within a set of concrete observations, was used for this purpose.

While in one way the survey was simple enough that a researcher could code, score, and evaluate the results with a pencil and paper, use of factor analytic methods provided a measure of validity. The computer—randomizing and reshuffling the data—served as a verifying or validating agent.

Factor analysis can be used to test hypotheses by elaborate math, but it tends to work better for reducing the complexity of the large number of survey items in which students evaluated the perceived quality of their programs.

In the factor analysis, a total of ten factors were derived from the survey items. These were: 1. Institutional capacities; 2. Institutional capacities and coursework; 3. Financial assistance and coursework; 4. Institutional capacities, relationship with faculty, and financial assistance; 5. Relationship with faculty, demographics, financial assistance, program information, and coursework; 6. Demographics and program information; 7. Demographics and financial assistance; 8. Program information and coursework; 9. Demographics, financial assistance, and program information; 10. Institutional
capacities, financial assistance, and course work.

A fairly close match was obtained from comparing the topics the survey was designed to disclose and the factors derived from the results of factor analysis. Items such as career options and forecast were essentially open-ended items that did not lend themselves to mathematical manipulation. These items are in Appendix C. It is interesting that the factor analysis repeatedly identified common elements and cross-referenced them with other survey topics, and so a clustering effect was revealed. For example, institutional capacities appeared in four contexts, coursework in five, financial assistance in six, and demographics in four, relationship with faculty in two, etc.

Since one major purpose of the survey was to discover adequacy of funding for doctoral students, the appearance of financial assistance in six factors tends to validate the survey on an internal basis: that is, it discovered the information it was supposed to discover. It is also interesting that relationship with faculty proved to be less important (by frequency of derived factors) than elements such as coursework, demographics, or support systems.

The derived factors are identified and discussed in detail below:

S-1. Institutional Capacities [Referring to survey items 7, 9, 10, 11, 12, 13, 14, 15, 16]
Factor #1 pertains to the topic Institutional Capacities. The subheading within Institutional Capacities is:

Lab Facilities.

(8) Electrical
(9) Metals
(10) Manufacturing
(11) Wood
(12) Graphic
(13) Computer
(14) Mechanical
(15) Plastics
(16) Construction

S-2. Institutional Capacities and Coursework [Referring to survey items 1, 2, 3, 4, 74]

Factor #2 pertains to items within the topics Institutional Capacities and Coursework. Library and Institution area sub-headings within Institutional Capacity.

Library

(1) Research capabilities
(2) quality of collection
(3) Easy retrieval

Institution

(4) Computation center services
Coursework

Have you produced:

(74) Articles

S-3. Financial Assistance and Coursework [Referring to survey items 40, 42, 49, 78]

Factor #3 pertains to items within the categories Financial Assistance and Coursework.

Financial Assistance

(40) Self-supported
(42) Teaching assistant
(49) Computer lab

Coursework

(78) Have you written or developed proposals?

S-4. Institutional Capacities, Relationship with Faculty, and Financial Assistance [Referring to survey items 6, 20, 21, 22, 23, 38, 39]

Factor #4 pertains to items within the topics Institutional Capacities; Relationship with Faculty; and Financial Assistance.

Institutional Capacities

Institution

(6) Availability of personal financial assistance

Relationship with Faculty

(20) Committee members
(21) Department faculty

Financial Assistance

(38) Corporate sponsorship

(39) Family financial support

S-5. Relationship with Faculty, Demographics, Financial Assistance, Program Information, and Coursework

[Referring to survey items 19, 34, 37, 60, 76, 78b]

Factor #5 pertains to the items within the topics
Relationship with Faculty; Demographics; Financial Assistance; Program Information; and Coursework.

Relationship with Faculty

(19) Major professor

Demographics

(34) Number of years in graduate school

Financial Assistance

(37) Student loans

Program Information

(60) Undergraduate major

Coursework

Have you produced:

(76) Book chapters?

(78b) Briefly describe funded projects

S-6. Demographics and Program Information [Referring to survey items 28, 32, 33, 53]

Factor #6 pertains to items within the topics:
Demographics and Program Information.

Demographics
(28) Telephone
(32) Marital status

Program Information
(53) Co-major

S-7. Demographics and Financial Assistance [Referring to survey items 30, 36, 43, 45]

Factor #7 pertains to items within the topics of Demographics and Financial Assistance.

Demographics
(30) Ethnic Origin

Financial Assistance
(36) Scholarship
(43) Research assistant
(45) Car/motor vehicle

S-8. Program Information and Coursework [Referring to survey items 55, 56, 64, 67, 75]

Factor #8 pertains to the items within the topics Program Information and Coursework.

Program Information
(55) What system are you in?
- quarter
- semester
- trimester
Coursework

What percent of your courses were:

(64) Theoretical?
(67) What types of elective courses did you take?

(see Appendix C)

Have you produced:

(75) Book chapters?

S-9. Demographics, Financial Assistance, Program Information [Referring to survey items 35, 43, 34c]

Factor #9 pertains to items within the topics of Demographics; Financial Assistance; and Program Information.

Demographics

(35) Are you involved in private business?

Financial Assistance

(43) Research assistant

Program Information

Did you do an internship or field study?

(54c) Was it required?

S-10. Institutional Capacities, Financial Assistance, and Coursework [Referring to survey items 18, 48, 63, 68]

Factor #10 pertains to items within the topics Institutional Capacities; Financial Assistance; and Coursework. Lab facilities is a sub-heading under Institutional Capacities.
Institutional Capacities

Lab facilities

(18) Others (specify)  {refer to Appendix C}

Financial Assistance

(48) Do you own a personal computer?

Coursework

What percentage of your coursework was:

(63) Professional?

Were you required to take:

(68) Research methods?

The close match between the derived factors and the original topics provides at least indirect evidence of the validity of topics used in this survey. This provides some measure of construct validity. These factors were then used in subsequent correlational analysis using Pearson product-moment correlations. The Pearson product-moment correlations were run in two batches dealing with student characteristics and network support.

The correlations dealing with "student characteristics" showed how the derived factors of program quality were related to student quality characteristics, such as undergraduate GPA, graduate GPA, and professional activities. The correlations dealing with "network support" examined relationships between the measures of student quality, and network support. These survey items referred
to bases of support for teaching and research assistants and were scored on a yes or no basis where "yes" = 1 and "no" = 0, for a 0-1 scale.

Threats to external and internal validity were minimized as students returned their results directly to the researcher. Confidentiality was assured to the participants.

Conclusions

The survey was designed to reveal information on nine specific topics. These were: 1. Institutional capacities; 2. Relationship with faculty; 3. Institutional support; 4. Financial Assistance; 5. Program Information; 6. Course work; 7. Financing and funding; 8. Career options; and 9. Forecast.

In the factor analysis, a total of ten factors were derived from the survey items. These were: 1. Institutional capacities; 2. Institutional capacities and course work; 3. Financial assistance and course work; 4. Institutional capacities, relationship with faculty, and financial assistance; 5. Relationship with faculty, demographics, financial assistance, program information, and course work; 6. Demographics and program information; 7. Demographics and financial assistance; 8. Program information and course work; 9. Demographics, financial
assistance, and program information; 10. Institutional capacities, financial assistance, and course work.

It will be recognized from comparing the topics that the survey was designed to disclose institutional capacities and the factors derived for the purpose of factor analysis that a fairly close match was obtained.

Derived factors

Research results relating to the derived factors are summarized below.

1. There is no relationship between student characteristics and their perceptions of the quality programs they are in.

   student characteristics:
   
   undergraduate g.p.a.
   graduate g.p.a.
   professional activities

Factors

According to the results reported in Table 1, the following factors report student perceptions of program quality:

1. Institutional capacities; results of analysis reported in Table 1 indicate that the relationship was not significant.
2. Institutional capacities and coursework; There was a significant relationship between the student's perception of the quality program he/she was in and the course work taken (Q 75a, 76, 78, and 78a significant at .05 level; Q 75 significant at .01 level).

3. Financial assistance and coursework; There was a significant relationship between financial assistance and course work (Q 77 significant at .001 level; Q 58 and Q 77a significant at .05 level).

4. Institutional capacities, relationship with faculty, and financial assistance; There was a significant relationship between institutional capacities, relationship with faculty, and financial assistance (Q 76a significant at .01 level).

5. Relationship with faculty, demographics, financial assistance, program information, and course work: there was a significant relationship between relation with faculty, demographics, financial assistance, and course work (Q 77a, 78a, 78b significant at .0001 level; Q 77 significant at .001 level).

6. Demographics and program information: there was a significant relationship between demographics and program information (Q 78b significant at .05 level).

7. Demographics and financial assistance: there was a significant relationship between demographics and financial assistance (Q 75 significant at .05 level).
8. Program information and course work: there was a significant relationship between program information and course work (Q 76 significant at .0001 level, Q 76a significant at .01 level).

9. Demographics, financial assistance, and program information: there was a significant relationship between demographics, financial assistance, and program information (Q 75 significant at .05 level).

10. Institutional capacities, financial assistance, and course work: there was a significant relationship between institutional capacities, financial assistance, and course work (Q 76 and 76a significant at .05 level).

In summary the results reported in Table 1 indicated that:

(1) Students do not perceive Institutional Capacities a significant factor (S1 = Institutional capacities) as a determinant of a quality doctoral program.

(2) The Course work offered was perceived as more important, overall, than the Institutional capacities (S2). However, the combination of course work and financial assistance (S3) is perceived to be more important than the institutional capacities alone. Relationships with faculty (S4) were perceived to be moderately important, but a larger combination of variables seems more important overall in constructing the factor (S5). Demographics seemed to be
moderately related to both program information (S6) and financial assistance (S7) but program information and coursework (S8) seem more important overall. The combination of institutional capacities, financial assistance, and coursework (S10) however, seem only moderately important overall. Based on the results reported in Table 1, it can be concluded that coursework is the most important single overall factor in determining quality in the graduate program.

Based on the results reported in Table 1, it can also be concluded that the most important factors in a quality program are (a) a well-defined program; (b) adequate financial assistance; and (c) adequate information on the program. Relationships with advisors are important, but less so than might be expected. Student demographics seem moderately related to financial assistance or program information.

There is no relationship between student perceptions of network support and student perceptions of the quality of the program.

Factors:

According to the results reported in Table 2, the following factors indicate student perceptions of network support:

1. Institutional capacities: there is no significant
relationship between institutional capacities and students' perceptions of network support.

2. Institutional capacities and course work: there is a significant relationship between institutional capacities, course work, and network support (Q 41 significant at .05 level).

3. Financial assistance and course work: there is a significant relationship between financial assistance, course work, and network support (Q 41 significant at .0001 level).

4. Institutional capacities, relationship with faculty, and financial assistance: there is a significant relationship between institutional capacities, relationship with faculty, financial assistance, and network support (Q 39, 41 significant at .05 level).

5. Relationship with faculty, demographics, financial assistance, program information, and course work: there is no significant relationship between faculty, demographics, financial assistance, program information, coursework, and network support.

6. Demographics and program information: there is a significant relationship between demographics, program information, and network support (Q 54 significant at .01 level).

7. Demographics and financial assistance: there is no
significant relationship between demographics, financial assistance, and network support.

8. Program information and course work: there is a significant relationship between program information, course work, and network support (Q 41 significant at .05 level).

9. Demographics, financial assistance, and program information: there is no significant relationship between demographics, financial assistance, program information, and network support.

10. Institutional capacities, financial assistance, and course work: there is no significant relationship between institutional capacities, financial assistance, course work, and network support.

Table III, Appendix C, represents the survey responses that can be tallied. Items left blank can be referred to in Appendix D because these were open-ended questions. It can be seen from the numerical results that:

1) Most graduate students seem to be satisfied with their institutions.

2) In terms of lab facilities, most graduate students rated their computer lab facilities very good or excellent, however, the high proportion of 'no opinion' or 'don't know' responses involving other lab facilities indicates a lack of knowledge.

3) It is not surprising that most graduate students report
a 'very good' to 'excellent' relationship with their major professor, committee members and faculty.

(4) Most graduate students have reported 'very good' to 'excellent' with institutional support.

(5) Graduate students in Industrial Education and Technology programs are almost all male (9:1).

(6) Ethnicity responses fall into the white category (9:1).

(7) Nearly half of the students reported four years or less at their institution.

(8) About half of the students reported four years or less in graduate school.

(9) Almost all graduate students reported 'self-supporting' in terms of financial assistance, however, nearly half reported receiving a research or teaching assistantship.

(10) Very few students reported receiving corporate support.

(11) Most graduate students reported to have produced one or more articles.

(12) University teaching and University research represents the top choices of Industrial Education and Technology graduate students in the area of career choices.

(13) It seems confusing that twice as many graduate students responded to International exposure but did not reflect that interest in career choices.
Identification of S1-S10 terms

Identification of S1-S10 terms on proceeding tables are as follows:

S1 - Institutional Capacities
S2 - Institutional Capacities and Course Work
S3 - Financial Assistance and Course Work
S4 - Institutional Capacities, Relationship with Faculty, and Financial Assistance
S5 - Relationship with Faculty, Demographics, Financial Assistance, Program Information and Course Work
S6 - Demographics and Program Information
S7 - Demographics and Financial Assistance
S8 - Program Information and Course Work
S9 - Demographics, Financial Assistance and Program Information
S10 - Institutional Capacities, Financial Assistance and Course Work
Table 1. Student perceptions of program quality (alpha=.05)

<table>
<thead>
<tr>
<th>Measures of student quality</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
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<td>.21</td>
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<td>.09</td>
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<td>-.08</td>
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<td>-.03</td>
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<td>-.33**</td>
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</table>

*Significant at .05 level  
**Significant at .01 level  
***Significant at .001 level  
****Significant at .0001 level
Table 2. Student perceptions of network support (alpha=.05)

<table>
<thead>
<tr>
<th>Measures of student quality</th>
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<th>S4</th>
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<td>.11</td>
<td>-.24</td>
<td>-.07</td>
<td>.01</td>
<td>-.09</td>
</tr>
</tbody>
</table>

*Significant at .05
**Significant at .01
***Significant at .001
****Significant at .0001
Based on analysis of the data, it would appear:

(1) On the network support items, S1, S5, S7, S9, and S10 were "not significant." No relationship appears to exist between institutional capacities (S1), relationship with faculty, demographics, financial assistance, program information, and course work (S5), demographics and financial assistance (S7), demographics, financial assistance, and program information (S9), or institutional capacities, financial assistance, and course work (S10). This finding is not surprising, since "network support" is often a matter of individual initiative and has little bearing on the capacities or support of the institution. However ...

(2) There seems to be a moderate relationship between student perceptions of network support and the perceived quality of the institution. The strongest relationship seems to be that if the institution is perceived to be of high quality in both course work and financial assistance (S3), other things will follow at a reduced level (S2, S4, S6, and S8). Of these, S5 (demographics and program information) appears to be somewhat more important than S2, S4, or S8 (institutional capacities and course work; institutional capacities, relationship with faculty, and financial assistance; and program information and course work).
Analysis of Findings

On the program quality area, it seems that the students are saying "good courses plus good funding equals a good program." On the network support, it seems that the students are saying "network support" is easier with funding coupled with a good program.

From these two items the following conclusions may be drawn;

(1) The institutional qualities are what the school provides the student but the network support systems are what the students acquire to support themselves.

It seems that if "internships" are considered a form of "financial assistance," there isn't and shouldn't be much relationship between financial assistance and the institution because the internship is a position you acquire yourself. Of course, it's always helpful in acquiring the position to come from what is recognized to be a "quality" school, because then you have the institution's credibility and adequate funding.
CHAPTER V. CONCLUSIONS AND RECOMMENDATIONS

Overview of Survey Results

Employers, industrial education and technology educators, the scientific and professional community, and the nation can benefit from accurate, up-to-date information pertaining to quality of doctoral programs as perceived by the doctoral students enrolled in the programs. The students, obviously, have the potential to make valuable and insightful client contributions to education and society.

Hypotheses

In Section I - Student Characteristics, the expectations are that:
(1) there is a positive relationship between undergraduate G.P.A. and student levels of satisfaction.
(2) there is a positive relationship between graduate G.P.A. and student levels of satisfaction.
(3) there is a positive relationship between professionally active students and student levels of satisfaction.

In Section II - Network Support, the expectations are that:
(1) doctoral students will feel positive about having outside assistance.
(2) a negative response will prevail when there is only
self support.

(3) a positive response will prevail when there is corporate support.

(4) a positive response will prevail when a respondent has a teaching or research assistantship with institutional support.

(5) a positive response will prevail when a respondent has scholarship support.

(6) the relationship will be indeterminate when loans are the primary source of support.

(7) the relationship will be positive when the military is the source of support.

(8) the relationship will be indeterminate when the family is the major source of support.

(9) the relationship will be positive when there is an opportunity for an intern/extern opportunity

The results of this study used different statistical analysis procedures than that of the study done at the University of Arizona, but confirmed two similar significant quality indicators of doctoral programs, student characteristics and network support. However, there may be other significant quality indicators that both studies may have omitted. Whether or not such quality indicators have been omitted could be a good research question for a different research study.
Research Questions

Answers to research questions are given below:

1. What is the general profile of current doctoral students nationwide?

The general profile of Industrial Education and Technology doctoral students indicates that most took an undergraduate degree in a related field. Most expect costs of graduate education to rise sharply in the future. Most rated their institutions' libraries as excellent, and considered financial assistance fair to very good. Lab facilities show a high number of "no opinion" ratings. Student-faculty relationships are typically better with the major professor than with the committee members. In general, institutional support was perceived as very good to excellent for all groups. Most doctoral students in the study consider themselves "self-supporting" but about half reported having other forms of assistance. Little support was reported from corporate or military sponsors. Most students were employed in an area relating to their programs, all have cars, and many commute. Well under half of the respondents reported having done an internship or field study. Well over half, however, reported having written articles and proposals.

2. What are the doctoral students' career goals?

The overall trend in career goals was toward university
teaching and university research, with employment in industry taking second place.

3. What are the doctoral students' recommendations for program improvements?

Well over half reported they think there is a need for international exposure or field work outside the United States. Other significant recommendations concern better intern/externships and improved funding. Intern/externships can provide practical experience in both academic and industrial settings and often provide sources of funding.

4. What, if any, trends can be identified from survey responses in terms of:

(a) population of doctoral students?

Most respondents described themselves as being self-supporting or employed commuter students. About half had received some type of financial assistance or support from other sources. More than half of the doctoral program students followed their undergraduate major in industrial education and technology or industrial arts, and therefore did not make an academic career change.

(b) Sources of support?

Almost all students described themselves as being "self-supporting." About half reported they had received a research assistantship and slightly more than half reported having received a teaching assistantship. About one-third
of the respondents reported they were working on a project or had received either outside assistance or family assistance. Few graduate students reported receiving any corporate sponsorship.

Results of hypothesis testing were as follows:

1. There is no relationship between student quality measures and student perceptions of the quality programs.

2. There is no relationship between student perceptions of network support and student perceptions of the quality of the program.

Based on the results reported in Table 1, it can also be concluded that the most important factors in a quality program are (a) a well-defined program; (b) adequate financial assistance; and (c) adequate information on the program. Relationships with advisors are important, but less so than might be expected. Student demographics seem moderately related to financial assistance or program information.

There seems to be a moderate relationship between student perceptions of network support and the perceived quality of the institution. The strongest relationship seems to be that if the institution is perceived to be of high quality in both course work and financial assistance (S3), other things will follow at a reduced level (S2, S4, S6, and S8). Of these, S5 (demographics and program
information) appears to be somewhat more important than S2, S4, or S8 (institutional capacities and course work; institutional capacities, relationship with faculty, and financial assistance; and program information and course work).

Implications

The last ten years have been highlighted by shifts in technology. The emergence of rapidly changing technology has had a tremendous impact and will continue to have an impact on the Industrial Education and Technology departments. The departments will have to be abreast of the industrial as well as the theoretical innovations that affect Industrial Education and technology departments nationwide.

Industrial Education and Technology departments should direct their resources towards developing an improved curriculum. The new courses should provide an introduction to understanding the concerns of business and industry. Students do not appear to be taught to function with administrators, perhaps because the assumption is that all students will become teachers. The student may not aspire to be in the teaching profession, but there is still a good possibility that he or she will work with someone in an administrative position. Curriculum revision that is aimed
at providing linkages with business and industry will be of paramount importance.

Emphasis in faculty development in Industrial Education and Technology will become more pronounced because technological change will force faculty to remain current with technology. The gap between technology and education seems to be an ever-widening situation, in part because the technology moves faster than the educational literature. Consequently, many professors in Industrial Education and Technology seem to be ill-prepared to lecture on contemporary topics involving business and/or industrial concerns. Faculty will have to continually stay abreast of the technological changes in industry and related fields which will lead to more current and relevant curricula. Innovative instructional methods and current industrial technology research must be sought out and incorporated into the curriculum to develop new relationships between education and industry.

Industrial Education and Technology departments should research other countries, industries, and institutions. Industrial Education and Technology departments are predicted to utilize new sources of information, which may be innovations resulting from contemporary concerns. As new resources for solving problems become available, the departments may be better able to respond quickly to the
needs of society as a whole.

Extracting the impact of the above implications for evaluating or improving the quality of doctoral programs in Industrial Education and Technology is difficult because each implication discovered by the study suggests presently unknown dynamics in the relationships between the elements examined.

It is inevitable that technological change will alter the curriculum and effect the research that students elect to pursue. Technological change effects the course content that graduates must acquire. Therefore, both the teaching of a particular technology and the types of industry with which Departments of Industrial Education and Technology choose to form linkages both are effected by technological change.

Recommendations

Any profession that wishes to grow must engage in research and evaluation. This is especially true within a field such as Industrial Education and Technology which, by its nature, is or should be on "the cutting edge" of industry, education, and technology. Implications and insights gained in the course of this study lead to the following research-oriented recommendations:

1. This study should be repeated in five or ten years,
when the current doctoral students have graduated and new ones have enrolled, to see how the field is progressing and make a preliminary effort at determining whether there is a "trend" evident.

2. If the study is repeated, personal interviews with respondents might be considered. However, the higher cost of the "personal interview" type of survey (even if conducted by telephone) makes this recommendation questionable. Therefore, the most reasonable "research-oriented" recommendation is to interview several respondents in depth using the same instrument and analytic techniques.

3. Whether the study is repeated or not, a study of doctoral student recruitment procedures is suggested.

4. Whether the study is repeated or not, a review of doctoral-student funding and support procedures is suggested.

5. Whether the study is repeated or not, a review of doctoral student curricula is recommended and considered an absolute "must." The curriculum evaluation should be innovative in nature and in keeping with current and potential future technologies.

6. If the study is repeated, the instrument should be modified to account for new technologies not presently in existence.
7. It is recommended that one of the professional organizations in Industrial Education and Technology or a foundation, such as the American Technical Foundation, call for competitive research proposals. These proposals would research quality indicators of doctoral programs in Industrial Education and Technology and would provide necessary funding for the support of such research.
REFERENCES


Dennis, Ervin A., Editor. (1990-91). Industrial teacher education directory, 29th edition. Council on Technology Teacher Education and National Association of Industrial and Technical Teacher Educators, Department of Industrial Technology, University of Northern Iowa, Cedar Falls, IA.


ACKNOWLEDGMENTS

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pertains to business and education.

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Thanks also to Dr. George Jackson for his financial backing throughout my entire graduate program.

Thanks to my friends, co-workers, and the administration and staff at Iowa State University, who always responded favorably in the midst of colliding schedules and demands.

Last, I thank the spiritual powers above that have obviously intervened to sustain me throughout my quest.
Profile of indicators of Industrial Education and Technology doctoral programs: 
Indicators for definition and evaluation

I have tried to make the instrument as simple as possible. Questions can be 
answered by circling the number of your response, checking the appropriate box, 
or filling in the blank.

**INSTITUTIONAL CAPACITIES**

Please rate your school in the following areas: 

| Library |
|------------------------|---------------|---------|---------|---------|---------|
| 1) research capabilities | Excellent | Very Good | Fair | Poor | No Opinion |
| 2) quality of collection | 5 | 4 | 3 | 2 | 1 |
| 3) easy retrieval | 5 | 4 | 3 | 2 | 1 |

| Institution |
|------------------------|---------------|---------|---------|---------|---------|
| 4) Computation Center Services | 5 | 4 | 3 | 2 | 1 |
| 5) Availability of institutional financial assistance | 5 | 4 | 3 | 2 | 1 |
| 6) Availability of personal financial assistance | 5 | 4 | 3 | 2 | 1 |

| Lab Facilities |
|------------------------|---------------|---------|---------|---------|---------|
| 7) electrical | 5 | 4 | 3 | 2 | 1 |
| 8) electronic | 5 | 4 | 3 | 2 | 1 |
| 9) metals | 5 | 4 | 3 | 2 | 1 |
| 10) manufacturing | 5 | 4 | 3 | 2 | 1 |
| 11) wood | 5 | 4 | 3 | 2 | 1 |
| 12) graphic | 5 | 4 | 3 | 2 | 1 |
| 13) computer | 5 | 4 | 3 | 2 | 1 |
| 14) mechanical | 5 | 4 | 3 | 2 | 1 |
| 15) plastics | 5 | 4 | 3 | 2 | 1 |
| 16) construction | 5 | 4 | 3 | 2 | 1 |
| 17) energy/power | 5 | 4 | 3 | 2 | 1 |
| 18) others specify | ( ) | 5 | 4 | 3 | 2 | 1 |

| ( ) | 5 | 4 | 3 | 2 | 1 |
| ( ) | 5 | 4 | 3 | 2 | 1 |
| ( ) | 5 | 4 | 3 | 2 | 1 |
RELATIONSHIP WITH FACULTY

Please describe the relationship you have with your:

19) major professor
20) committee members
21) department faculty

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<th>Good</th>
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INSTITUTIONAL SUPPORT

How supportive was central administration toward graduate studies for:

22) American students
23) American minority students
24) international students

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FILL IN THE BLANK

Demographics:

25) Age ____________
26) Name ________________________________ (optional)
27) Address ________________________________ (optional)
28) Telephone (_____) ____________________________ (optional)
29) Gender Male ( ) Female ( )
30) Ethnic Origin ____________________________
31) U.S. Born: Yes ( ) No ( )
32) Marital Status: single ( ) married ( ) separated ( ) divorced ( )
33) # of years at present institution: ____________ years
34) # of years in graduate school: ____________ years
35) Are you involved in private business? _____ Yes _____ No
   a. If yes, how many years? ____________ years
   b. Salary previous to graduate study: $___________/month

FINANCIAL ASSISTANCE

Have you ever received any of the following:

36) scholarship Yes ( ) No ( )
37) student loan Yes ( ) No ( )
38) corporate sponsorship Yes ( ) No ( )
39) family financial support Yes ( ) No ( )
40) self supported Yes ( ) No ( )
41) military Yes ( ) No ( )
42) teaching assistant Yes ( ) No ( )
43) research assistant Yes ( ) No ( )
44) Are you employed in an area related to your doctoral degree program? Yes ( ) No ( )
45) Do you have a car or other motor vehicle? Yes ( ) No ( )
46) Do you live in college/university housing? Yes ( ) No ( )
47) Do you commute? Yes ( ) No ( )
48) Do you own a personal computer? Yes ( ) No ( )
49) Is your department equipped with its own computer lab? Yes ( ) No ( )
a. If so, briefly describe: ____________________________

PROGRAM INFORMATION
50) Are you studying towards a: Ph.D. degree ( ) Ed.D degree ( )
51) Major: ____________________________
52) Minor: ____________________________
53) Co-major: ____________________________
54) Did you do an internship or field study? Yes ( ) No ( )
   If so, in what and where?
   a. What? ____________________________
   b. Where? ____________________________
   c. Was it required? Yes ( ) No ( )
55) What system are you in? quarter ( )
    semester ( )
    trimester ( )

Were there preliminary exam requirements?
56) written: Yes ( ) No ( )
57) oral: Yes ( ) No ( )
58) What was your undergraduate GPA? (on a 4.0 scale) _______________________
59) What is your graduate GPA? (on a 4.0 scale) _______________________
60) What was your undergraduate major? ____________________________
61) Have you changed majors while in graduate school? Yes ( ) No ( )

COURSEWORK
What percentage of your courses were:
62) technical 10-25% 26-39% 40-60%
63) professional 10-25% 26-39% 40-60%
64) theoretical 10-25% 26-39% 40-60%
65) pedagogical 10-25% 26-39% 40-60%
66) outside electives 1-10% 11-20% 21-30%
67) What types of elective courses did you take:


Were you required to take:
68) research methods Yes ( ) No ( ) If yes, number of credits? ___
69) statistics Yes ( ) No ( ) If yes, number of credits? ___

70) Please list coursework outside of major (do not include electives):


71) Please list coursework in technical or applied technology education:


72) Have you received industrial training?
   Yes ( ) No ( )

73) Please list independent studies:


Please describe your research interests and activities:
Have you produced:
74) articles Yes ( ) No ( ) If yes, how many? ___
75) books Yes ( ) No ( ) If yes, how many? ___
76) book chapters Yes ( ) No ( ) If yes, how many? ___
77) development of software Yes ( ) No ( ) If yes, how many? ___
78) Have you written
   or developed proposals? Yes ( ) No ( ) If yes, how many? ___
   a. How many proposals became funded projects? ___
   b. Briefly describe the funded projects: ____________________________

FINANCING AND FUNDING

79) Research Assistant Yes ( ) No ( );
   Duration, from _____ to _____.

80) Teaching Assistant Yes ( ) No ( );
   Duration, from _____ to _____.

81) Corporate Sponsorship Yes ( ) No ( );
   Duration, from _____ to ____.
82) Working on Project  Yes ( ) No ( )
Duration, from _______ to _______

83) Self Supporting Yes ( ) No ( )

84) Outside Assistance Yes ( ) No ( )

85) Family Assistance Yes ( ) No ( )

CAREER OPTIONS

86) Please rank your top five career choices
(with 1 your first choice, 2 your next...
and 5 your fifth choice).

University teaching ( )
University research ( )
University technical or scientific staff ( )
University administration ( )
Community College teaching ( )
Community College administration ( )
Employment outside of Education ( )
Training in industry ( )
Government (state, municipal or local) ( )
Government (federal) ( )
Consulting (in U.S.) ( )
Consulting (International) ( )
Other ____________________________ ( )
Other ____________________________ ( )

FORECAST

87) What changes do you envision regarding study costs will occur over the next ten years?
__________________________________
__________________________________
__________________________________

88) Is a national grant needed? Yes ( ) No ( )

89) Is there a need for international exposure or field work outside of the U.S.? Yes ( ) No ( )
April 15, 1991

Dear Doctoral Candidate in Industrial Education:

My name is Keith Johnson and I am currently wrapping up my Ph.D. in Industrial Education and Technology with a co-major in Higher Education at Iowa State University. I am interested in determining contemporary profiles of doctoral candidates in Industrial Education.

Your institution was selected because of your graduate program at the doctoral level. I am only sampling limited programs that offer the Ph.D. so your response is of paramount importance to me.

Attached is a copy of my questionnaire for you to fill out, which need only to be stapled when completed and dropped in the mail. I am allowing 30 days in which to collect my data and your timely attention is most appreciated. All responses will be kept confidential.

Respectfully,

Keith E. Johnson
Doctoral Candidate
Iowa State University

William D. Wolansky
Professor and Director
International Education
APPENDIX C: TABLE III
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Excellent</th>
<th>V. Good</th>
<th>Fair</th>
<th>Poor</th>
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<td>18a</td>
<td>1(MS)</td>
<td>2(R,P)</td>
<td>1(D)</td>
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<td>18b</td>
<td>1(D)</td>
<td>1(F)</td>
<td>1(T)</td>
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<td>(Relationship with faculty)</td>
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<td>32</td>
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<td>(Demographics)</td>
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<tr>
<td>29</td>
<td>GENDER:</td>
<td>47 M</td>
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<td>1</td>
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<tr>
<td>30</td>
<td>ETHNIC ORIGIN--</td>
<td>20 Cauc.</td>
<td>5 Black</td>
<td>13 Other</td>
<td>9 n.a.</td>
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<tr>
<td>31</td>
<td>U.S. born:</td>
<td>45 Y</td>
<td>7</td>
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<td>1</td>
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</table>
Marital status:
- 10 SINGLE
- 36 MARRIED
- 0 SEPARATED
- 4 DIVORCED

# years at present institution:
- 7: 1 YR OR LESS
- 8: 2 YRS OR LESS
- 14: 3 YRS OR LESS
- 2: 4 YRS OR LESS
- 4: 5 YRS OR LESS
- 6: 6 YRS OR LESS
- 2: 8 YRS
- 1: 12 YRS
- 2: 17 YRS

# years in grad school:
- 3: 1 YR OR LESS
- 4: 2 YRS OR LESS
- 14: 3 YRS OR LESS
- 12: 4 YRS OR LESS
- 9: 5 YRS OR LESS
- 4: 6 YRS OR LESS
- 3: 7 YRS
- 3: 8 YRS

Private business involvement:
- 15 Y: 38 N

35a, if yes, has been skipped as insignificant
35b, salary previous to grad school, has been skipped

(Financial assistance)

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<th>Yrs.</th>
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<td>Corp Sponsorship</td>
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<td>Family Fin. Support</td>
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<td>25 N</td>
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<td>Self-support</td>
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<td>Coll/Univ Housing</td>
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<td>12 N</td>
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<tr>
<td>P/C ownership</td>
<td>39</td>
<td>13 N</td>
</tr>
<tr>
<td>Dept. Computer Lab</td>
<td>40</td>
<td>9 N</td>
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If yes:
- 31 IBM OR COMPATIBLE
- 29 MAC OR APPLE
- 2 CAD
- 1 NETWORK

(Program information)

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<th>Type</th>
<th>Ph.D. or Ed.D.</th>
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<td>Ph.D. or Ed.D.</td>
<td>44 Ph.D. 8 Ed.D.</td>
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Internship/field study: 20 Y 32 N

Was it required: 8 Y 19 N

System: 16 QTR 50 SEM 0 TRIMESTER

Written prelimin required 47 Y 3 N
Oral prelim required 38 Y 13 N

Undergrad GPA ignored because too various
Grad GPA ignored because too various

Undergrad major: 11 INDUSTRIAL ARTS 13 INDUSTRIAL EDUCATION 23 OTHER FIELDS

Change of majors in grad school? 11 Y 4 N

(Coursework)

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types of electives ignored because too variable

research methods required? 51 Y 1 N

credits required:

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<td>5</td>
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<td>11</td>
<td>MORE THAN 9 CR</td>
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<td>3</td>
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stat required?

stat credits required:

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<td>10</td>
<td>9 CR</td>
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<tr>
<td></td>
<td>16</td>
<td>OTHER THAN 6 or 9</td>
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</table>

Have you received industrial training? 27 Y 21 N

articles produced 34 Y 17 N

(29 reported having produced between 1 and 4 articles; of these, 13 reported having produced 2 articles).
75 books produced 8 Y 42 N
(of these, 4 reported having produced one book)
76 book chapters 6 Y 42 N
77 developed software 7 Y 42 N
78 written or developed proposals 39 Y 18 N

subquestions

(Financing and funding)
79 Were you a RA? 23 Y 24 N
80 Were you a TA? 30 Y 17 N
81 Corp Sponsorship 6 Y 39 N
82 Working on Project 15 Y 32 N
83 Self-supporting 46 Y 2 N
84 Outside assistance 13 Y 28 N
85 Family assistance 17 Y 28 N

(Ranking of top 5 career choices)

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<th>3rd</th>
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<tr>
<td>Univ/tech &amp; sci staff</td>
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<tr>
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<td>9</td>
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<td>2</td>
<td>---</td>
<td>3</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Work outside educ.</td>
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<td>7</td>
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<td>5</td>
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<td>Govt (state, etc.)</td>
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<td>1</td>
<td>3</td>
<td>---</td>
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<tr>
<td>Govt (federal)</td>
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<td>4</td>
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<td>Consulting (U.S.)</td>
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<td>5</td>
<td>9</td>
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<tr>
<td>Consulting (INTL)</td>
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<tr>
<td>Other</td>
<td></td>
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</table>

(Forecast)

87 10 year outlook: General trends are--
CONSTANTLY GOING UP: 15
INC. STUDY COSTS: 13
HIGHER TUITION: 2
LESS GRANTS: 4
RES. $$ FROM PVT. SEC: 2

88 Is national grant needed? 23 Y 16 N (1 n.a.)
89 Need for INTL Exposure? 34 Y 13 N (1 n.a.)
APPENDIX D: SUPPLEMENTAL SURVEY RESPONSES
49a. Briefly describe departmental computer lab.

- various types, quite sufficient
- IBM PS2 and PC's
- 3 labs, approximately 10 each of Apple, Mac & IBM; Apple lab being phased out; Mac—solid but no growth; IBM lab—to be expanded via a grant obtained
- MAC & IBM connected to mainframe
- 4 Macs, 3 Apple IIe, 1 IBM clone
- ne in Industrial Ed
- mixed collection of IBM XT, AT etc—approximately 30 units
- local area network of PC's plus mainframe connection
- IBM 386 and Zenith 286 PC's with work processing, quality Control, graphics, CAD, spreadsheets, etc.
- at least 15 apples
- I have a computer in my office owned by the department.
- lab consisting of 24 computers and computer workroom of 10 computers
- poor facility, only IBM plus 1 MAC SE
- CAD, network, etc.
- IBM/MAC computer hardware
- work processing & CAD (mostly IBM)
- IBM, Zeniths used for classes; no laser printers, not always available for personal use
- 6 IBM PC's, 1 MAC Classic, 20 IBM XT's
- 4 Apple IIe, 8 Mac, 2 IBM
- Macs
- 3 machines in departmental area
- multiple micros xt, at, ps2, apple
- both IBM & Mac
- variety of computers—well equipped lab
- 3 Mac, 1 laser printer, one scanner, 1 plotter
- all apple (I needed IBM compatible.)
- IBM
- PC with network and server
- 5 Macs, 2 IBM PC's, 30 Apple II's, 1 Apple GS
- 4 Mac+, 1 PC xt, 1 IBM PC, some Apple II
- Macs
- 20 Mac SE plus imagewriter II and laser printers
- 4 Mac and some Apple computer
- Mac & IBM network
- 2 labs with 20 PC's each, mostly PS2's
- 12 Mac
- PC's
- 10 PC, 8 terminals connected to mainframe
- IBM PC
- PC's (IBM)
- IBM PC

51. Major

7 Technology Education
7 Industrial Education
2 Community and Human Resources
12 Vocational Education
2 Vocational/Technical Education
4 Industrial Technical Education
4 Education
1 Human Resources-Training and Development
2 Instructional Design
5 Training and Development
9 Industrial Education and Technology
5 Vocational and Industrial Education
2 Curriculum and Instruction
1 Industrial Arts
1 Administration
1 Evaluation RMAC in Vocational/Technical Ed

52. Minor

Public School Administration
Adult Education
Instructional Design Technology
Measurement and Statistics
Organizational Development
Human Resource Management
Vocational/Industrial Education
Graphics
Radio, TV and Film
Curriculum (2)
Evaluation of Technology Education
Safety
Industrial Technology
History
Administration (3)
Vocational Evaluation
Industrial Education (3)
Instructional Systems Design (2)
Education
Industrial/Organizational Psychology
Management
Higher and Adult Education Foundations
Counseling
Communications
Manufacturing Technology
General Studies
Quality Control
Technology Transfer
Computer Engineering

53. Co-Major

Industrial Technology
Computer Science
Curriculum and Instruction
Vocational Education
Higher Education
Television Technology
Design Education
Instructional Technology

54. What and Where did you do an internship and field study?

<table>
<thead>
<tr>
<th>What:</th>
<th>Where:</th>
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<tr>
<td>Payload Mission Support</td>
<td>NASA (Goddard Space Flight Center</td>
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<tr>
<td>Correctional Vocational Ed</td>
<td>Nebraska Dept of Corrections</td>
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<tr>
<td>tribal employment training</td>
<td>Tulsa, OK</td>
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<tr>
<td>Organizational Dev Interventions</td>
<td>Wisconsin University Medical Center</td>
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<tr>
<td>directorship</td>
<td>local arts</td>
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<tr>
<td>Voc Ed job corps</td>
<td>US Dept of Labor</td>
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<td>Safety/hearing/noise</td>
<td>city government</td>
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<td>research/exhibits</td>
<td>Smithsonian Institute</td>
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<td>comprehensive Vocational school</td>
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<td>Asst Dean of occupational ed</td>
<td>Colorado Mt.</td>
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intern-American Voc Assoc. Hdqtr
State Department
interactive video instruction
training and development
state dept eval system

training
training and development

forklift safety training prog
evaluation consultant
microprocessors

College
Washington, D.C.
Lincoln, NE

state dept
private sector
MN dept of education

Onan Corporation
Sky Brothers
Dow Chemical
Pennsylvania

58. Undergraduate GPA Average = 3.20

59. Graduate GPA Average = 3.71

60. Undergraduate Major

Industrial Arts Education (11)
Industrial Education (19)
political Science (3)
T & I
Business Administration and Economics
Vocational Education (3)
Psychology (4)
Supervision
Home Ec Education
History (2)
Art
Electro/Mechanical Robotics
Medical Technology
Math
French
Hotel, Restaurant Management
Business
English
Criminal Justice
Health & Phys Ed
Physics
Engineering
Electrical Engineering Technology
67. Electives

Engineering Graphics
Cognitive Science
Related Automation
CNC
Robotics
Electrical Engineering (2)
Evaluation
Finance
Higher Education (2)
Statics
Human Resource Development (2)
World Religion
Christianity and Culture
Early Church History
Computer Engineering
Management courses
Engineering courses
Application of Technology to Societal Problems
introduction to Life Cycle Engineering
Industrial Safety
CAD-CAM (3)
Management Theory
Organizational Development
Organizational Psychology (2)
Organizational Theory
Human Factors
Human Information Processing
Training
Supervision of Teachers
Curriculum Management
Philosophy of Vocational Education
International Education
Adult and Continuing Education (3)
Statistics (6)
Occupational Education
Research Methods
Journalism
Instructional Systems
Statistical Quality Control
Facility Planning
Industrial Philosophy
Internships
Physical Education (swimming)
Spanish
Curriculum and Instruction (2)
History (2)
Philosophy (2)
Educational Psychology
Economics
Sociology of Education
Psychology (3)
Speech Communication
Technical Writing
Computer Programming (5)
Special Education
Developmental Psychology
Public Affairs
Energy Policy
Industrial Relations
Computer Research Methods
Career Planning
Sociology
Decision Theory
Personnel Development
Administration (2)
Leadership
Management (2)
Communications (2)
Counseling
Engineering Psychology

70. Coursework Outside Major

Seminar in American Indian Education
Introduction to Computer Education
Teaching Adults
Problems in Community Colleges (2)
Research Methods I & II
Intermediate Statistics
Adult Education (5)
Psychology of Teaching College (2)
Educational Administration
Management
International Education
Statistics (4)
Art
International Business
Health and Safety
Occupational Health
Safety Internships
School Law (2)
Perspectives of Educational Administration
Introduction to Educational Administration (2)
Higher Education (2)
Curriculum Development
Instructional Systems Design
Foundations of Instructional Systems (2)
Introduction to Computers for Education
Computer Based Instructional Systems
Curriculum and Instruction Systems
Research and Inquiry
Educational Psychology
Industrial Education
Motivation and Achievement
Instructional Design
Anthropology
Education
Information Sciences
Career Counseling & Guidance (2)
Research
Counseling Adults
American College and University
Multiculture
Electronics
Computer Science

71. Coursework in Technical/Applied Technical Education

CAD/CAM (3)
Research and Experimentation in Industrial Arts
Education
Lab Practicum
Training Needs Assessment
Strategic Planning - Education of Work
Managing the HRD function
Time Management for Industrial Training
Quality Control
Industrial Education Courses
Training and Development in Business and Industry
Woodworking
Furniture Design
Wood Technology
Continuing Problems in Technology
Facilities Planning in Technology Education
Issues/Trends in Technology
Research/Readings in Technology
Foundations of Vocational/Technical Education (2)
Technical Developments in Technology
Practical Arts
Audiovisual Implementation in Industrial Arts
Electricity
History of Industrial Arts
Curriculum Development in Home Economics Education
Curriculum Development in Vocational Education
Industrial Training
Supervision of Vocational Education
Administration in Vocational Education
Fiscal and Facilities Management
Current Practices in Agricultural Education
Computer Programming (WATFIVE)
Robotics (4)
Lab Planning Management
Implementation of Instruction in Industrial Education
Foundations in Industrial Education
Critical Issues in Vocational Education
Microcomputer Applications
Foundations of Career
Disciplined Inquiry
Research Studies in Vocational Technology
Technology Communications
Production Development
Manufacturing Management
Industrial Studies
Introduction to Operations Research
Computer Graphics
Published Research Analysis
Statistics
Quality Control
Communication Graphics
Evaluation
Computer Networking
Cooperative Education
Electronics

73. Independent Studies

Grant Writing
Evaluation
Program Development
Continuing Education Budgeting
Communication Tendencies/Apprehensions of Industrial Ed Students
Vocational Foundations of Nebraska
Electricity/Electronics
Microcomputer Managed Video Interactive Safety Simulator
CAD/CAM
Strategic Planning of Intervention
Cooperative Education Pedagogy
Departmental Organization
Product Life Cycle Engineering
Needs Assessment of Kentucky Industrial Ed Programs (K-12)
Sociology of Education
Higher Education
History
Individual Research Project
Design of Vocational Educator Training Curriculum
Review of Technology Databases
Proposal Development
Development of a Communications Course
Thesis Background Development
Desktop Publishing
Marketing
Pneumatic/Hydraulic Loop Design
CNC Program
Review of Aircraft Maintenance
Study of CAI at Paderborn University in Germany
Possible Implementation of CAI
Study of Elementary Science Curriculum in Taiwan
Administration
Survey Research

78b. Describe Funded Projects

- Computer grant (Tandy); technical concepts training units, hydro, pneumatics, mechanical, electric
- Leadership needs of Nebraska Vocational Education; integration of technology into Liberal Arts; Improvement of business/industry cooperatives with statewide vocational education agencies; performance appraisal of vocational teacher education in Nebraska; personal investment as a motivational technique among academic fundraisers; statewide coordination of vocational teacher education programs
- Safety
- Instructional enhancement grant (Center for Teaching Excellence-Ohio State)
- State funded economic development/employee training/development program for business and industry
- Research intergeneration education
- Industrial training program; provides health and safety training to industry
- Accident investment - an OD project design to upgrade accident investment skills of public agencies
- Mine official certification project - designed to develop an instruction manual
- Several scholarships and three cooperative education grants for three separate school divisions, one regular cooperative education grant serving four school districts; one stay in school initiative research grant
- All at government level, written in conjunction with government for school to work program
- Research in Higher Education for University Council on Vocational Education
- Research on legislation
- Curriculums - teacher and student training package
- Research and development for an Army lab
- Fast food lab research project
- Test of model in real world organization
- Received a laser for holography study
- Computerized tool wear monitor system for furniture industry
- Evaluation of training program at Dow Chemical
- Support center - assist automation of construction offices/assist in automation of army hardware stores
- Automation of management of design review
- Testing of software in operations environment

87. Study Costs

- They will increase 10% each year.
- It will increase beyond reach of unemployed grad students.
- Tuition will increase with increasing financial concerns; programmatic decrease will continue; Higher Education will become increasingly cognizant of programs with low enrollments and adjust accordingly.
- Tuition will increase; cost of living off and on campus will also rise (2)
- They will increase. (28)
- Baby boomers have completed much of their education. As the numbers of student shrink, costs will increase. Increase in tuition costs in combination with substantial opportunity costs.
- Estimate over $100,00 for a 4 year degree by the
year 2000.
- From instructor to Associate Professor and TA, Professor, Chair Person and Dean of College.
- Increase, smaller percentage covered by assistance; less for non minorities.
- 30% increase in tuition; fewer state funded grants, more private funding of grants.
- Costs will increase, outside funding for graduate student will increase (can't get any worse)
- Costs will double
- Increase in tuition, decrease in opportunity for funding.
- Costs increase in time and money - neither justifiable.
- Support (grants) doesn't appear to be improving.
- Tuition will increase 40% over next 5 years.
- Only minority and international students will be able to afford top universities, along with rich whites. Middle class whites will go to community or less than 4 year schools as costs increase and assistance decreases.
- Increase at a rate greater than inflation
- Costs will increase, government sponsored research will decrease, research money will come from private sector. As costs increase, it will be tougher for kids of non-professionals to get financial aid.
- Costs will increase 50-75%