THE FIRST STEP IN TECH-PREP PROGRAM EVALUATION: THE IDENTIFICATION OF PROGRAM PERFORMANCE INDICATORS

by

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(abstract)

Little information is available which specifically applies to determining Tech-Prep program quality, effectiveness, and goal-attainment as determined by the directors/coordinators of the programs. This research sought to determine if program performance indicators exist that Tech-Prep directors/coordinators deem necessary to determine their programs' quality, effectiveness, and goal-attainment. If so, is there consensus of agreement among the directors/coordinators on which performance indicators to utilize, and is there a pattern of preference when grouped into evaluation focus components?

A questionnaire was developed by the researcher and distributed to Tech-Prep directors/coordinators in the Southeastern United States and Puerto Rico. Sixty-seven program directors/coordinators were asked to participate, and 85 percent responded to the survey.

The following conclusions can be reached from analysis of the data:

1) The responding Tech-Prep directors/coordinators are in agreement on which program performance indicators to use to determine

the quality, effectiveness, and goal attainment of their programs. These findings are contrary to the existing literature which suggest a lack of consensus on which performance indicators to utilize for vocational education programs.

2) Three different techniques -- consensual agreement, consideration of the questionnaire non-response rate, and data analysis ensuring a 95 percent confidence interval of the standard error of the mean -- were used to analyze the extent of agreement among the surveyed Tech-Prep directors/coordinators on appropriate program performance indicators. Using the three techniques, the extent of majority agreement on the program performance indicators ranged from 97 to 67 percent of the sixty selected indicators. These data support the conclusion that agreed upon performance indicators are available for comparison and evaluation of Tech-Prep programs among this population. These data fill the void in the literature that addresses generalizable performance indicators that can be used in the evaluation and assessment of vocational programs, such as Tech-Prep.

3) Program performance indicators were grouped into six focus components. Although the determination of which focus components are more appropriate for vocational evaluation depend on many factors, data from this survey indicate the STUDENTS focus component is perceived as

most important, the RESOURCES focus component is least important, and CAREERS, PROFESSIONAL DEVELOPMENT, ATTITUDE/PERCEPTIONS, and FACILITATORS focus components are deemed equally important by Tech-Prep directors/coordinators in the determination of program quality, effectiveness, and goal attainment.

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Chapter 1

INTRODUCTION

Tech Prep 2 + 2 programs are seen as the bridge between secondary schools and community colleges in preparing people for technical careers for the 21st Century (Key, 1989; Parnell, 1985; Parnell, 1991; Scott, 1985; Scott, 1991; Wimmer, 1988). The national commitment to this concept is evidenced by the federal legislation approved on September 25, 1990: the Carl D. Perkins Vocational and Applied Technology Education Act, authorizing $63.4 million to the state and territories to fund the Tech-Prep Education Act (United States Department of Education Office of Vocational and Adult Education, 1991, January 18). Tech-Prep programs are cooperative arrangements which combine two years of technological preparation in high school with two years of advanced technology studies at a community college, or an apprenticeship program of at least two years.

Tech-Prep is a relatively new concept for Vocational Education in our nation (Parnell, 1984; Parnell, 1985). As such, Tech-Prep programs are in various stages of development. Simply put, Tech-Prep has three

stages of development, which Carolyn Dornsife (1991) has labeled as "beginning, intermediate, and advanced" (p.4). Portions of the three stages are well-documented by the amount of literature devoted to each stage. Examples of the documentation in the literature include the establishment of various consortia between secondary and post-secondary educational environments and the formation of articulation agreements between these environments. Another well-documented stage is the development of competency-based curricula with applied academics integrated throughout. Program marketing has a lion's share of the literature and the involvement of career and guidance counseling literature is beginning to appear. However, there is one obvious omission: the "program improvement" area (Dornsife, 1991, p. 66), also known as program assessment and evaluation (Hammons, 1991a).

Educational institutions at every level are experiencing external pressures from business, industry, labor, and national, state and local governments to implement change while increasing program quality, accountability, and effectiveness. Vocational education has not been immune to these pressures. The Federal Director of Vocational and Technical Education (Warnat, 1991) called for vocational educators to add focus "on performance standards, competency development and assessment with built in accountability as never before" (p. 25) to assist

our nation's drive toward enhanced global competitiveness.

Traditionally, vocational education has had major problems in the assessment and evaluation of its programs. Some of these problems include: evaluations which are too informal; results that are seldom used for improvement; evaluations lacking a systematic plan requiring the defining of the evaluation effort (Center for Vocational Education, 1978); lack of feedback and long-term commitment; self-reporting; and, evaluations done in a one-time, hit-or-miss fashion (Wasdyke, 1978; Wentling, 1975).

Additional problems in evaluating vocational education include the lack of vocational student outcomes from which several conclusions can be drawn and which are necessary for the development of performance indicators and measurement tools to determine if students can perform entry-level job skills (Wasdyke, 1978). Currently, national performance indicators necessary for setting goals and direction for vocational programs, in addition to insuring program quality and effectiveness, are not available (National Assessment of Vocational Education, 1989). Vocational education has been in existence and funded federally in the United States, in one form or another, for over a century, and comparisons of vocational programs, state to state, cannot be accomplished because of the absence of a comprehensive set of

performance indicators. Vocational education's inability to develop a consensus of performance indicators which could provide data that are quantifiable, comprehensive, and aggregatable has hampered the profession's ability to assess and evaluate programs in addition to proving and improving program quality and effectiveness.

Vocational education's slogan, *Vocational Education Works*, delivered in the absence of program performance indicators to validate that statement, sends a contradictory message to students, parents, politicians, and policy-makers. This lack of proof not only questions the image and quality of education provided by the profession, but also jeopardizes future funding initiatives for vocational programs including Tech-Prep. These conclusions are based on recent statements made by Betsy Brand, the Assistant Secretary for Vocational and Technical Education, during an interview. When asked about the image of vocational education as the dumping ground for the low-achieving students, and what could be done about the image (Gardner & Reinhard, 1991), Ms. Brand's response was "...the most important thing is to ensure that programs are of high quality....You've got to demonstrate quality before people really change their conceptions of voc-ed" (p. 12). And in a speech addressing the National Association of State Directors of Vocational Education (Staff, 1991a) Ms. Brand warned:

> ....the next four or five years are critical to vocational education....If in five years, vocational-technical education has not improved throughout the nation in terms of quality and scope, some of the support may slip and folks [Congress and administration] may begin looking at other delivery systems" (p. 21).

There has never been a more critical time in vocational education's history to demonstrate the quality and effectiveness of its programs. If these warnings are ignored it may well be the beginning of the end for all vocational program funding.

Tech-Prep programs are viewed by many in vocational education as an avenue for change, reform and even educational revolution (Hoerner, 1991a). The general philosophy of the National Tech-Prep initiative establishes a series of goals which may give vocational education a much needed boost, in addition to providing an opportunity to implement change (Congressional Record, 1990). Even with the best of intentions, these goals will be adversely effected by the lack of program performance indicators which allow Tech-Prep programs the opportunity to exhibit quality and effectiveness. The following examples illustrate this point.

A major Tech-Prep goal is the development of linkages between educational institutions and environments allowing students to move from one level of learning to another without unnecessary repetition or duplication of course work. The most obvious connection is the linkage

between secondary (high school) and the post-secondary (community colleges and technical schools) institutions. There is additional incentive and emphasis written into the Carl Perkins (Congressional Record, 1990) legislation to extend and encourage these linkages to include four-year colleges and universities. Bringing these different educational environments together along with their faculty and staff, both academic and vocational, allows for a working interaction and dialogue long overdue in the profession. This interaction among all parties is said to be one of the most rewarding experiences of the Tech-Prep initiative (Hammons, 1991a). These Tech-Prep linkages began with a unique problem as evidenced in an article (Staff, 1991b) appearing in the July 31, 1991, Chronicle for Higher Education entitled, "Plan to link school and 2-year colleges is off to a bad start" (p. A15-A16). The article reported that all of the $63.4 million allotted by the Carl Perkins Act of 1990 for Tech-Prep funding was being withheld from any institution with a student loan default rate of 20 percent or higher. This action excluded over 160 community colleges from initially taking part in the Tech-Prep initiative. California's community college system was impacted especially hard in that 74 of 107 community colleges were declared ineligible. This event presented a classic case of how Congress and policy-makers grouped all students together into one category because there were limited quantitative

measurements available to assess the effectiveness of the programs; in this instance these programs happened to be Tech-Prep (Dornsife, 1991; Hammons, 1991a). But in order to facilitate and improve the cooperation between secondary and two-year post secondary colleges on vocational education, a compromise bill (Public Law 102-103) was signed by the President. This bill amended the Perkins Vocational and Applied Technology Education Act to exclude only those colleges with default rates of 35 percent and greater (Staff, 1991c). This grouping of all students, including Tech-Prep students, causes federal funding issues to become clouded with regard to both program and student eligibility. The result is an increase in the probability that eligible students will be deprived of vocational education monies to which they are entitled.

Another major goal of Tech-Prep is to prepare students to assume the roles of a highly skilled workforce which can be a competitive force into the 21st century. This goal fits perfectly into the country's new national strategy for attaining educational excellence, The National Goals for Education (1990) and America 2000: An Education Strategy (1991), in that both stress the need for Americans to possess the knowledge and skill necessary to compete in a global economy (Roth, 1991). Tech-Prep programs are focused to attract the nearly one-half of all high school students who are enrolled in the non-college bound 'general' curriculum,

which "...provides neither strong academic nor vocational skills" (National Center on Education and the Economy, 1990, p.46). The primary approach used by the Tech-Prep initiative to facilitate the emergence a highly skilled work force has been the development of a competency-based, relevant curriculum. In addition, the Tech-Prep initiative has begun the process of integrating applied math, science, communications, and technology concepts into the curriculum as well. By using this type of applied, integrated curriculum, Tech-Prep programs are suggesting that school drop-out rates will decrease; structure and substance will be provided to the ordinary learner; and, students will be assisted in developing sound skills and knowledge while obtaining technical education preparation (Shapiro, 1986). If successful, Tech-Prep may well be the educational sequence for supplying highly technical vocational teachers of the future (Welch, 1991, p.20).

Currently, our nation has no system which can set high academic standards and assess the achievement against these standards for the student who is not college-bound -- the non-baccalaureate (National Center on Education and the Economy, 1990). The applied Tech-Prep curriculum may be the mechanism our nation needs to set these high academic standards, but without performance indicators and an evaluation component, it may never be known if Tech-Prep program

standards have succeeded. Exacerbating the problem, Congress omitted any requirement to evaluate Tech-Prep programs, per se, in the Carl Perkins legislation (Congressional Record, 1990).

Cronbach (1982) discussed the requirement to evaluate large education programs. He suggested that these types of programs require multi-year plans of evaluation, particularly ones that consist of many different sub-programs and objectives, delivered by complex systems, at many different educational locations. Tech-Prep programs fit that description. Dutton (1991) considered the evaluation component as vital to every Tech-Prep program with the formal evaluation process beginning early on in the program development involving the "...collection and processing of the data, and the reporting of the results with recommendations" (p. 108).

However, there is a lack of data and materials addressing Tech-Prep program improvement. Dornsife (1991) attributed this lack of materials due to the limited amount of time (one to five years generally) that programs have been in existence, adding that it would take an additional five to seven years for Tech-Prep to evolve to the stage where programs could formally analyze data to determine quality, effectiveness and goal attainment efforts and to publish the results. In my opinion, this particular message sends mixed signals to the Tech-Prep audience as to

the need and urgency of timely evaluation of programs to assure quality, effectiveness, and goal attainment.

Unfortunately, as the literature suggests, Tech-Prep programs appear to be instep with the past history of evaluation in vocational education, where little has been done to determine program assessment, effectiveness or goal attainment. Data obtained in the Fall of 1991, substantiate this rationale. The data, acquired from an on-going Tech-Prep national survey, revealed that scarcely more than one-fourth (27 percent) of the respondents (N=227) checked a "yes" answer to the question asking if their programs had an evaluation plan (Hoerner, Clowes, & Impara, 1991).

The program evaluation efforts of Tech-Prep range from the absolute omission of any reference to an evaluation component to a few bold attempts to initiate the process. The omissions are evident in statewide Tech-Prep initiatives such as The North Dakota Tech-Prep Initiative (1991), and in the statewide Rhode Island Tech-Prep 2 + 2 Program Guide (Marmaras, 1990). Ramer (1991) reported that state leaders in the Tech-Prep movement in California were unwilling to specify Tech-Prep program performance indicators. Without indicators Tech-Prep program evaluation cannot be attempted. At best, the Tech-Prep evaluation data which do exist are extremely vague and lack the

performance indicators necessary to provide data to determine if Tech-Prep programs are accomplishing the goals that their proponents say they are accomplishing (Dornsife, 1991; James, 1991; Portland Area Vocational Technical Education Consortium, 1990). The only report found in the literature that mentions unsuccessful tech-prep programs was produced by Hull (1991). Hull's report suggested that many early attempts at developing articulated tech-prep 2 + 2 programs in Texas had failed to meet the standards established by their programs' definition. A review of the literature uncovered only two examples of attempts to specifically and systematically evaluate Tech-Prep programs, one statewide (Delaware Consortium on Technical Preparation Programs, 1989; Delaware Consortium on Technical Preparation Programs, 1991), and the other a single program on the local level (Hammons & Eschenmann, 1990). These two evaluation models share similar design characteristics. However, both models lack performance indicators which could be used to gather data to comprehensively determine program quality and effectiveness and be studied for comparative program analysis.

Statement of the Problem

The literature contains many studies which identify countless numbers of performance indicators for vocational and occupational programs, but little published information is available which specifically applies to determining Tech-Prep program effectiveness (Dornsife, 1991) and quality as determined by the directors and\or coordinators of these programs.

The literature suggests that program performance indicators are necessary to determine the quality, effectiveness, and program goal attainment. However, the literature also suggests that performance indicators are not available to make comparisons among national vocational programs (National Assessment of Vocational Education, 1989). In addition, performance indicators are not available to make national, state, and even local Tech-Prep program comparisons (Dornsife, 1991; Hammons, 1991), and there is no clear indication that performance indicators will be developed. The following discussion illustrates why this may be the case.

Program performance indicators are not normally determined by the individuals or "stakeholders" who have the ultimate responsibility for program success or failure, rather, they are determined by policy-makers

and high-level administrators whose only stake in the program is political (Cronbach, 1982: National Assessment of Vocational Education, 1989). This is contrary to the philosophy of the educational accountability movement, which asks, as in business, that the decision-making process be given to the school staff responsible and holding that staff accountable for both student and program performance (National Center on Education and the Economy, 1990). The determination of exactly what Tech-Prep program performance indicators are required by the "stakeholders," specifically Tech-Prep program directors/coordinators, may help resolve two of the major challenges in vocational program evaluation.

First, by allowing Tech-Prep directors/coordinators to determine their program performance indicators, evaluation data may be gathered in a very relevant sense to meet the concerns of these particular programs and participants. These data may provide the "stakeholders" with pragmatic information that may be used to verify program quality, effectiveness, goal attainment, decision-making, and program improvement (Dornsife, 1991).

Secondly, the goal-oriented Tech-Prep philosophy may assist in the identification of common program performance indicators which may generate data from which general conclusions can be drawn (National Assessment of Vocational Education, 1989).

Rationale for the Study

Research has suggested that performance indicators which determine vocational program effectiveness are important data in the evaluation process (National Assessment of Vocational Education, 1989). However, specific generalizable performance indicator data for Tech-Prep programs are not available (Dornsife, 1991; Hammons, 1991a).

The rationale to identify performance indicators as determined by individuals with a stake ("stakeholders") in the effectiveness and quality of Tech-Prep programs adds a new dimension to the vocational evaluation process. It is a logical choice to empower the "stakeholders" with the responsibility of insuring program quality along with the premise that "stakeholders" determination of performance indicators will increase the use of evaluation results in their decision-making (Weiss, 1986), as history has proven that policy-maker determination of quality indicators does not work (National Assessment for Vocational Education, 1989; Wasdyke, 1978). For this research, Tech-Prep program directors/ coordinators were chosen as the primary "stakeholders" for two reasons. First, they are ultimately responsible for the success and failure of the program and have the most to lose if the Tech-Prep program is not successful. Secondly, Tech-Prep program directors/coordinators are the

individuals responsible for providing the logistics, services, and coordination between all program committees and activities. In addition, the directors/coordinators act as the liaison with business, industry, government, labor, and educational institutions, as well as with the general public in the community the program serves. The director/ coordinator is the spokesperson and the focal point for all Tech-Prep program activities (Hull, 1991). Furthermore, the director/coordinator has access to data which enable a vision of the total Tech-Prep program.

Therefore, due to the lack of data on Tech-Prep program performance indicators the need exists to address the following questions: What are the Tech-Prep program performance indicators which Tech-Prep program directors/coordinators deem necessary to determine program quality, effectiveness, and goal attainment? To what extent do Tech-Prep directors/coordinators agree on selected performance indicators that can be used as a basis for comparison and/or evaluation? Which performance indicators when grouped into focus components are perceived important by Tech-Prep directors/coordinators? The answers to these questions should provide data useful for administrators, policy-makers, Tech-Prep program administrators, vocational instructors, vocational education evaluators, and teacher-educators in Tech-Prep program evaluation.

Research Questions

Data are lacking about Tech-Prep 2 + 2 performance indicators that may be used to comprehensively assess and evaluate a Tech-Prep program's quality, effectiveness, and goal attainment. More specifically, the research questions associated with the study are:

1. What are the Tech-Prep program performance indicators which Tech-Prep program directors/coordinators deem necessary to determine program quality, effectiveness, and goal attainment?

2. To what extent do Tech-Prep directors/coordinators agree on selected performance indicators that can be used as a basis for program comparison and/or evaluation?

3. Which performance indicators when grouped into focus components are perceived important by Tech-Prep directors/ coordinators?

Assumptions

This study is based on the following assumptions:

1. It can be determined through surveying Tech-Prep program directors/coordinators which performance indicators can be utilized to

demonstrate program quality, effectiveness, and goal attainment.

2. The sample selected for this research is representative of the general population of Tech-Prep programs.

Delimitations

The following delimitations are associated with the study:

1. The respondents may exhibit "stakeholder bias" by providing program 'vindicators' in lieu of program performance 'indicators' (Weiss, 1986).

2. The respondents to this study are to be Tech-Prep directors/ coordinators from American Vocational Association's Region II (Southeastern United States and Puerto Rico) making data applicable only to that population.

Definitions

The following definitions of terms used in this study correspond to terms found in the literature:

Articulation agreement. A commitment between institutions to a program designed to provide students with a non-

duplicative sequence of educational achievements leading to competencies in a Tech-Prep program (Hoerner, et al., 1991).

Consensual validity. The type of validity conferred upon a measure by experts on the basis of their special familiarity with the subject (Poister, 1978).

Content validity. Suggestions from colleagues and experts in the field for the purpose of identifying and removing any ambiguities or items that do not contribute to a questionnaires purpose (Best & Kahn, 1989).

External validity. The extent to which the variable relationships can be applied to other settings, other treatment variables, other measurement variables, and other populations (Best & Kahn, 1989).

Focus components. The focus areas of any program's evaluation. The specificity of the components will vary depending upon the program being evaluated (examples of focus components are facilities and equipment; students; and, faculty) (Wentling, 1975).

The focus components used in this study are evaluation requirements established for Tech-Prep programs by the 1990 Carl Perkins Act, and components utilized in the evaluation of traditional vocational programs. The following focus components are addressed in this study:

STUDENTS. The focus component which includes a variety of

characteristics or performance indicators that places primary responsibility of attainment upon the student.

FACILITATORS. This focus component refers to many individuals, services, and programs designed to facilitate the professional development of the students enrolled in Tech-Prep.

PROFESSIONAL DEVELOPMENT. The focus component which encompasses all of the qualifications necessary for the student to enter into their chosen profession.

ATTITUDES/PERCEPTIONS. The focus component which seeks the opinions of all individuals involved with the Tech-Prep program.

CAREERS. The component which refers to the labor market indicators of the Tech-Prep program.

RESOURCES. This component refers to the availability and utilization of physical plant, monetary, and personnel assets.

Internal validity. The quality of a data-gathering instrument or procedure that enables it to measure what it is supposed to measure (Best & Kahn, 1989).

Performance indicators. A series of indexes, sometimes called program performance measures (Hoachlander, 1991), used to comprehensively measure the quality, effectiveness, and goal attainment of an educational program (National Assessment of Vocational Education,

1989).

Reliability. The degree of consistency that the instrument or procedure demonstrates (Best & Kahn, 1989).

Stakeholder. A person who makes decisions about a program, and whose life is affected by the program and its evaluation (Weiss, 1986).

Tech-Prep program director/coordinator. An individual responsible for the coordination of all activities within the Tech-Prep program, providing logistical and support services as needed, preparing program reports (Hull & Parnell, 1991).

Tech-Prep programs. An articulated educational program of two-years of secondary school and two-years of post-secondary preparation which includes a common core of math, science, communications, and technologies designed to lead to an associate degree or certificate in a specific career field (Hoerner, 1991a).

Chapter Summary

This chapter has presented problems concerning the lack of Tech-Prep program performance indicators to determine the program's quality, effectiveness and goal-attainment. Literature examined suggested that performance indicators are important to the vocational evaluation process,

but data which can be generalized, aggregated, and used to compare Tech-Prep programs have yet to be identified.

Chapter 2

REVIEW OF THE RELATED LITERATURE AND RESEARCH

The amount of literature available on Tech-Prep is indicative of its early stage of development and implementation. An extensive review of the literature was conducted dealing with the major constructs of Tech-Prep program evaluation, program performance indicators (PPI) and focus components. The following resources were utilized: an ERIC search; The National Tech-Prep Clearinghouse at Sangamon State University in Springfield, Illinois; the National Center for Research in Vocational Education (NCRVE), University of California, Berkeley; and, the Virginia Tech Library System (VTLS).

The literature contained few examples of Tech-Prep evaluation models. Research strongly indicates that for program evaluation to be effective it must have structure. Generally, vocational education texts have suggested Stufflebeam's (1969) context, input, process, and product (CIPP) model (Finch & McGough, 1982; Wentling, 1975).

The literature revealed one study similar in nature to this research (Wentling & Barnard, 1986). That study, however, was designed to

identify perceived vocational education outcomes in major categories or components, not specific program performance indicators. It was not used in this research.

Literature Related to Tech-Prep Program Evaluation

The literature revealed three well documented Tech-Prep stages: articulation -- the linking of training environments and marketing the concept; curriculum development -- consisting of defining competencies, competency-based curriculum development, the DACUM process, and integration of academics with vocational education; and, general status reports -- describing program implementation and development.

There is abundant research addressing the need for general vocational and educational programs to identify goals and performance indicators in order to evaluate program effectiveness and outcome attainment, including many suggested examples (Finch & McGough, 1982; Hoachlander, 1991; Strickland & Asche 1987; Wasdyke 1978; Weiss, 1972; Wentling, 1975). But literature which addressed Tech-Prep program evaluation and improvement, and performance indicators which addressed the characteristics of Tech-Prep are essentially not available (Dornsife, 1991; Hammons, 1991a).

The performance indicators cited in the literature for general vocational programs meet with many complaints and criticisms, such as, lack of consensus, no standards for aggregation, and narrow focus, which in many instances renders the data collected totally ineffective for analysis of vocational programs (National Assessment for Vocational Education, 1989; Strickland & Asche 1987; Wasdyke, 1978; Weiss, 1972).

The literature discusses evaluation as a politically driven process (Nevo, 1986; Wasdyke, 1978; Worthen & Sanders, 1973) with program goals established by legislators and policy which may be too detached and abstract to be evaluated (Cronbach, 1982). This may also be the case for Tech-Prep because there are lofty program aspirations listed in the legislation but having no evaluation requirements for Tech-Prep programs. The evaluation process of vocational education programs is left to the states, with federal legislation requiring only the bare basics for program assessment (Congressional Record, 1990; Hoachlander, 1991). This may be a cause of the lack of literature in regard to Tech-Prep program assessment, evaluation, and general program improvement methods (Congressional Record, 1990; Dornsife, 1991; Hammons, 1991a).

Tech-Prep Defined

The Carl D. Perkins Vocational and Applied Technology Education

Act of 1990 addresses Tech-Prep education and stipulates the requirements for these programs. The Act defines Tech-Prep programs as consisting of two-years secondary and two-years higher education, or at least two-years of apprenticeship training with each group having a common core of math, science, technologies, and communication to lead to an associate degree or certification. Some of the program goals set forth in the Act are: (1) an articulation agreement must be developed between the educational agencies involved in the program; (2) training programs must be provided for both teachers and counselors; and (3) equal access must be available for special populations. Special considerations for funding are to be given to those programs addressing the at-risk and minority populations, involving business and industry, and providing employment placement to the students or transfer students to 4-year programs (Congressional Record, 1990).

The literature strongly suggests that there is no consensus on how to define Tech-Prep programs. At a Tech-Prep workshop, Maurice Dutton's (1990) presentation provided evidence of the many different programs in existence. The examples of definitions include: articulation, 2+2 articulation, 2+2 Tech-Prep/Associate Degree Program, related terms such as 2+1 articulation, 1+2 articulation, 4+2 articulation, Tech Prep 2+2 or 4+2, and finally 2+2+2 articulation.

A delphi study conducted in California indicated the difficulty of defining Tech-Prep. The study failed to develop a consensual definition of 2 + 2 programs. The study reported:

> ...that because the label "2+2" has been used broadly within the field, that what ought to constitute a 2+2 program is not clear: there is no general agreement about what the essential components of such a program are" (Ramer, 1991, p. 1).

Additional definitions in the literature of Tech-Prep refer to various unique components, such as: business and industry linkages, general occupational skills, specific job training, applied technology education, high technology, sequential course of study, and, apprenticeship training (Bragg, 1991; CORD, 1991; Department of Education, 1991; Hoerner, Clowes, & Impara, 1991; Hull, 1991; The North Dakota Tech-Prep Initiative, 1991).

Background and Philosophy of Tech-Prep Programs

The concept of Tech-Prep is not an entirely new idea. It may be traced back to 1925, where a similar concept was introduced by Leonard Koos in The Junior College Movement. Koos proposed a "six-four-four" plan which called for six years of elementary school, four years of middle school, and four years of high school-junior college work (Vaughan, 1985). Another citation in the literature mentioned the longevity of the Tech-Prep concept in that successful 'developmental' programs had been

in operation for over twenty-years (Feldman, 1988).

The Tech-Prep concept evolved from the articulation movement in the 1970's. Articulation is a process for coordinating the linking of two or more educational systems within a community to help students make a smooth transition from one level to another without experiencing delays, duplication of courses or loss of credit (CORD, 1991).

An example of the evolution of Tech-Prep from articulation is referenced in the literature. In the Commonwealth of Virginia, formal articulation agreements between secondary and post-secondary institutions have existed for two decades. From these agreements, the creation of a 2+2 model for comprehensive articulation has evolved.

The "2+2" plan was fueled by business and industry's demands for professionally trained workers requiring more skills than two years of secondary training could develop (Virginia Department of Education, 1988). Some states have not had the success with articulation that Virginia enjoys. For example, the attempts at articulation in California have not been widely successful. When they have occurred, they were done "... sporadically and on a course-by-course basis" (Ramer, p. 13). "Stubborn provincialism..." (Parnell, 1984, p.9; Parnell, 1985, p. 134) was seen as a cause of failure of many in these programs.

Examples in the literature which noted the indiscriminate use of the

term articulation included: "2+2 Articulation" to refer to many types of articulation such as, advanced placement, tech-prep, 2+2, and 2+2+2 programs (CORD, 1991); and "Tech-Prep" as an "advanced skills" articulation model (Lankard, 1991). The term 'articulation' has become synonymous with Tech-Prep because of agreements which link secondary and post-secondary institutions (National Council for Occupational Education, 1989).

In the new Carl Perkins (1990) legislation, which included applied academics and advanced technical skills training, Tech-Prep programs are now designed to advance students beyond the traditional 2 + 2 articulated programs (Hull, 1991).

The current Tech-Prep philosophy is credited to Dale Parnell (Hoerner, 1991; Hull, 1991; Scott, 1985; Scott, 1991; Shapiro, 1986), who announced the program in his book, The Neglected Majority (1985). The common theme among Tech Prep 2 + 2 programs is to prepare students for both higher education and the workplace. To accomplish this, the programs must develop applied, articulated, academic and technical course work for students in grades 11 through 14 although some programs begin an indoctrination process for students entering into the program in their middle school grades. Generally, students enter the program as high-school sophomores. After graduation from high-school,

they may choose either to receive apprenticeship training, or continue with a post-secondary education and graduate with an associate degree. The programs' course work stresses heavy concentrations of applied math, science, technology and communication skills, along with technical job training. Another characteristic of the programs is that they involve business, industry, labor, and government agencies in the development and advisory process (Hull & Parnell, 1991).

Tech-Prep programs are not designed to replace the college-prep program but rather to offer students an alternative to higher education and technically skilled occupations. About one-third of all high school students are in the college prep curriculum and continue their education at a traditional four-year college. Another one-fourth of high-school students plan to enter the work force directly after graduating, and the remaining 40 percent learn a general curriculum with little focus and preparation for either the work place or higher education. The student enrolled in the general high-school academic track is the target audience for Tech-Prep programs (Hull & Parnell, 1991; Parnell, 1985).

There are three major approaches for advanced education and skills training in Tech Prep programs. The first is called the Advanced Placement Program also known as the time-shortened program. The program grants students advanced placement in post-secondary

programs offering them a number of advantages. These include the elimination of course work redundancy, which decreases the time spent at a post-secondary institution. The second major approach is called the Advanced Skills Program. This approach, unlike Advanced Placement, does not offer a shortened program, but does offer students advanced placement at the post-secondary level with the following advantages: reduced course work redundancy and advanced training, and exposure to higher-level occupational skills. And the third approach is the Apprenticeship model, which offers students an alternative for advanced training outside the traditional post-secondary educational setting. The apprenticeship model offers the following advantages: applied academics and vocational skills training in high school, and at least two years of apprenticeship training after high school, leading to a certificate (Congressional Record, 1990; Dutton, 1991b).

Philosophically, the National Education Goals and the basis for Tech-Prep are very similar in nature (Hoerner, 1991b). Both emphasize higher education in the areas of math, science, and literacy skills for all students. The basic philosophy behind Tech-Prep is to provide an avenue for our Nation's youth (non-baccalaureate) to pursue further learning and productive employment (Parnell, 1985).

Daniel Hull, President and Chief Executive Officer of the Center for

Occupational Research and Development (CORD) advocates the establishment of committees which are required to establish, promote, and maintain Tech-Prep programs (Hull, 1990). These committees would be in the areas of leadership, implementation, curriculum development, information/promotion, and evaluation. The literature contains examples of suggested responsibilities for each of these committees. However, specific literature is not available addressing the evaluation of Tech-Prep programs (Dornsife, 1991). In addition, research of existing Tech-Prep programs in Virginia suggests that committees established to evaluate programs are virtually non-existent (Hammons, 1991).

Tech-Prep Evaluation Models

Program evaluation defined. Definitions of program evaluation are mentioned many times in the literature (Chelimsky, 1978; Finch & McGough, 1982; Johnson & Grafsky, 1973; Suchman, 1971; Weiss, 1972; Wentling, 1975). Each definition of program evaluation has a common theme: that evaluation "...more or less involves program goals and the effectiveness in which a program attains the goals of the program" (Caro, 1971 p. 2).

According to Carolyn Dornsife (1991) the basic purpose for Tech-Prep program evaluation is to collect data to meet two basic concerns. The first is "...to meet the concerns of practitioners and other

'stakeholders,' and to provide useful information for making decisions on program modifications" (p. 66). The second is "...to meet the concerns of management audiences, and to fulfill the legislative requirements of the state accountability system" (p. 67).

There is much in the literature discussing the success of Tech-Prep, however little data are available to suggest the outcomes and goals of the Tech-Prep programs are being met. The following discussion of examples of Tech-Prep program evaluation addresses this point.

Examples of Tech-Prep program evaluation. A report of an impact evaluation conducted by a team from the Oregon Alliance for Program Improvement at Oregon State University is a prime example of Tech-Prep program evaluation reporting. The report was submitted to the Oregon Department of Education Division of Vocational-Technical Education in the Fall of 1989, which used the terms "good, more, and strong indication" (p. 16) as data indicators to highlight a number of program accomplishments (Portland Area Vocational Technical Education Consortium, 1990).

Other examples include data which only imply that Tech-Prep programs are impacting the school systems that utilize the Tech-Prep model. Examples of implied data reporting include data from two of the most prominent Tech-Prep programs in the nation: PACE (Partnership

for Academic and Career Education), and the Richmond County, North Carolina program. In 1991, PACE was awarded the "Tech-Prep of the Year Award" (National Tech Prep Network, 1991). However, the award was presented for accomplishments made with program implementation and program development. No reference was made to evaluation outcomes, even though the program has been in existence for four years. The indicator data reported for PACE included the number of students who planned to attend community college and the number of high school graduates, without mentioning the number of Tech-Prep students enrolled or involved in the program. The indicators presented clearly do not indicate that the PACE program caused these increases. The PACE program has been in existence for over four years and if specific program performance indicators were available, program successes could be proved and not implied.

The other example is the Richmond County, North Carolina, educational program, which has reported improvement in some areas since implementing Tech-Prep. These include an increase in number of students completing Algebra I, reduced drop-out rates, and a significant increase in the number of students continuing post-secondary education. Richmond County's model began in 1986 to build a data base with the intent to track Tech-Prep program performance. However, the school

board had other ideas and adopted indicators to measure the attainment of six educational goals for the entire county's educational program. The six goals and corresponding indicators include: 1) to improve student achievement in basic skills (reading, language, and mathematics test results); 2) to increase Scholastic Aptitude Test scores; 3) to decrease the drop-out rate (percentage of drop-outs in grades 7-12; 4) to increase percentages of high school graduates attending 4-year, 2-year, and trade and technical schools; 5) to increase technical literacy of all students (measured by the percentage of student enrollment in: college prep, tech-prep, and general education, and end of course testing in algebra I, II, and biology); and, 6) to improve student attitudes toward school and learning (student response to questionnaire survey on motivation). Richmond County published a school system "Report Card" (Dornsife, 1991, Appendix 2N) in fall 1989 which indicated little conclusive evidence that Tech-Prep did anything to improve the educational well-being of the county's student population. Statements made on the report card included "increased average SAT scores" (Hull & Parnell, p.168), "percentage of high school students completing Algebra I increased" (p. 168), and "drop-out rates decreased" (p. 168). These conclusions may be true for the entire Richmond County Educational System, but the data are vague and these same results were mentioned in statements like "the

percentage of high school students completing Algebra I has increased from 47 percent in 1986 to 75 percent in 1990" (Hull & Parnell, 1991, p.166). The only data which mentioned Tech-Prep specifically was Goal 5, percentage of program enrollment. The data percentage format was expressed without reference to the number from which these percentages were calculated and compared. Even these data indicated drops in the percentage of Tech-Prep enrollment in year 1988, 1989, and 1990. In short, when further scrutinized, the data produced little evidence to indicate the positive effects of Tech-Prep in Richmond County (Dornsife, 1991).

The literature on Tech-Prep evaluation contains only a few references to models and methodology used to specifically evaluate Tech-Prep programs - the Delaware Consortium on Technical Preparation Programs (1989; 1991) and the Hammons & Eschenmann (1990) Evaluation Plan. Both models vary in scope in that the Delaware model is designed to evaluate the Tech-Prep effort of an entire state and the Hammons and Eschenmann model was designed to evaluate a single program.

The State of Delaware began developing a statewide cooperative for the development and implementation of "2+2" Tech Prep programs during fiscal year 1987 (Delaware Consortium On Technical Preparation

Programs, 1987, p. 1). A systematic state-wide evaluation plan for Tech-Prep was developed and improved upon in 1991. Delaware has an advantage over many other states and that advantage is the availability of a state-wide computer system, the Educational Computer System (ECS). The ECS is capable of monitoring a Tech-Prep student's educational progress over a period of years from one educational institution to another. One of the mission statements (Delaware Consortium on Technical Preparation Programs, 1991) directed the developers to "design an evaluation model to track program and student success" (p. 6), with the intent to observe "...what happens to (students) after graduation" (p.21). According to the authors, Delaware's evaluation procedures were established with three priorities in mind: 1) to provide for a transition of academic and demographic data from the secondary file to the post-secondary file; 2) to maintain a permanent record of the file so that a report on the data could be compiled and to perform correlations to ascertain program effectiveness; and, 3) to simplify the process so that classroom teachers were not burdened by unnecessary paperwork, requiring that "...total teacher obligation is 10 minutes per year" (p. 29) in the evaluation process. Also listed in the Evaluation and Assessment section of the document (Delaware Consortium on Technical Preparation Programs, 1991, p. 26-38) are descriptions of what type of study

methodology were to be used (descriptive study). All pre-registered students would be divided into two categories (p.32), those awarded advanced credit and those not awarded advanced credit. In addition, descriptors were to be maintained to include demographics (race, sex, handicapped, etc), grade point average (secondary and post-secondary), standardized test scores (secondary and post-secondary), and which students earned an Associate Degree or whether they entered Bachelor's Degree Program. A third group was to be identified as non-tech-prep and was to be randomly selected for future comparative studies.

The Delaware evaluation plan also proposed seven studies to determine program effectiveness and goal attainment. The studies would include 1) measurement of recruitment effects; 2) feeder school accomplishments (pre-registration of secondary graduates to post-secondary programs); 3) pre-registration to post-secondary tech-prep programs; 4) criteria for admission to Delaware Technical Community College as determined by test scores on the Career Guidance and Placement (C.G.P.) test with either ACGP (above average admission score or ABGP (below average score); 5) drop-out comparisons (tech-prep versus non tech-prep - random sample) grades 9-12; 6) comparison of achievement scores (random sample - tech-prep versus non tech-prep) on Stanford Achievement Test; and, 7) Delaware Technical Community

College grade point average (tech versus non-tech - random sample).

The document referred the reader to a flow chart which depicted the program data timetable (p.38). This chart did not refer to the actual dates these studies would be accomplished, only the sequence of the studies, with Study 1 completed before Study 2, and so forth. The document mentioned that the various Tech-Prep data studies and comparisons would be conducted in Delaware during a five year period (p.35) with no start date indicated (Delaware Consortium On Technical Preparation Programs, 1991).

The Delaware evaluation model also provided for the collection of demographic data on each Tech-Prep student, such as, the individual's history of all advanced college credits, grades, etc. These data files can be cross-referenced to three other file systems maintained by the Delaware Department of Public Instruction: a graduate follow-up study, state drop-out analysis, and, Achievement Testing using the Stanford Achievement Test (Delaware Consortium On Technical Preparation Programs, 1989 p. 18).

The other example of a systematic Tech-Prep program evaluation is the Roanoke County Automated Manufacturing Technology Evaluation Plan (Hammons & Eschenmann, 1990). Initially, the evaluation plan developers were contracted by the program director to fulfill the evaluation

requirements of a single program. However, the developers attempted to create a document that could also be used to evaluate the program's effectiveness and goal attainment. The plan used a modified Stufflebeam (1983) model and integrated the Lucas, Miles, and Weber (1973) evaluation matrix, which examined the input-process-product elements of the program. The evaluation plan's focus components which addressed the product segment included: curriculum development, audio-visual development, and students. The developers of the plan also provided a variety of survey instruments which may be used by the program administrators to assess the program. The evaluation plan had provisions to solicit input from numerous stakeholders: students, alumni, employers, faculty members (Hammons & Eschenmann, 1990). The plan was an ambitious effort considering it was written in 1990, and because beginning students would not enter this program until the Fall of 1991. However, it is the most comprehensive single Tech-Prep program evaluation located during the review of the literature.

Development of Tech-Prep program evaluation. The literature suggests that evaluation of Tech-Prep programs is in its very early stages of development, and is often ignored as part of the development process. The State of Illinois issued an information sheet which detailed the minimum requirements for agencies to obtain funds for Tech-Prep

programs under the new Carl Perkins Act. The state did not require any form of program evaluation to be eligible for the funds. In addition, some states have experienced difficulty in determining exactly what are the components and the definition of a Tech-Prep program (Ramer, 1991). The absence of either makes the establishment of curricula and evaluation components impossible.

Carolyn Dornsife's (1991) monograph for the National Center for Research in Vocational Education, which was found to be the most complete document on Tech-Prep program improvement, made two points that warrant attention. Based on her research, she suggested that "...Most administrators believe it takes five to seven years of operation before a comprehensive evaluation can be conducted and any major program improvements instituted" (p. 66). In addition, Dornsife stated that "...during the first year of operation most administrators collect information for evaluation purposes through informal means (e.g., telephone calls, unscheduled meetings). In turn, there is a limited amount of published data, and restricted access to any information contained in school records" (p. 66).

Vocational education no longer has the luxury to wait five to seven years to evaluate the quality and effectiveness of any program including Tech-Prep. One reason, and an excellent incentive for more timely

evaluations, is the warning from the federal government that if program quality is not assured, funding may be lost (Staff, 1991a). Furthermore, the statement that new programs cannot be evaluated because the data are collected informally and not published is inaccurate. Even programs in existence for a long time, with volumes of published literature like those of vocational education, are not being evaluated at a national level. It is not because a program is new that it cannot be evaluated, but rather because the necessary comparative measurements have not been established and resulting data not collected and published.

In 1973 Worthen and Sanders said, "evaluation is one of the most widely discussed but little used processes in today's educational systems" (p. 1). The literature has indicated that not much has changed in program evaluation over the years, which might explain why the quality of educational programs, particularly vocational education programs, are questioned.

Criticisms of Evaluation

The literature disclosed a long history of problems, weaknesses, and criticisms of program evaluation (Wasdyke, 1978; Weiss, 1986; Wentling, 1975; Worthen & Sanders, 1973). The items identified in the literature should provide the reader with an idea of the problems associated with vocational program evaluation, suggested strategies to

avoid those identified problem areas, and areas needed to be addressed with research.

A synthesized list of the problems, criticisms, and weaknesses of general and vocational education program evaluation discussed in the literature include: (1) planned and systematic evaluation processes are lacking in general; (2) intuitive problem solving is generally employed and problems are only addressed when they surface; (3) results of the evaluation processes are seldom used for improvement, but rather to prove product delivery; (4) evaluations lack commitment of time and resources and are narrowly focused; (5) evaluations are not directed to empirically defining both short-term and long-term criteria for evaluating the effectiveness of vocational education programs which causes vocational programs to be judged primarily on job-placement rates; (6) evaluations are usually conducted on a one-time basis; (7) evaluations are usually conducted on an isolated program or project; (8) data are case-specific and the outcome data provide little information that would be helpful in improving other programs; (9) project evaluations are generally of the self-report variety; (10) lack of rigorous and systematic follow-up evaluation examining the programs effect over an extended period of time (Wasdyke, 1978; Weiss, 1986; Wentling, 1975; Worthen & Sanders, 1973); and, (11) program success has been determined generally by one

criterion - initial job placement - while little attention has been given to defining additional criteria that may be important program performance indicators which may be used to determine the effectiveness of vocational programs (Wasdyke, 1978).

The last criticism mentioned above is the focus of this study, which will attempt to identify the program performance indicators necessary to determine Tech-Prep program quality, effectiveness, and goal attainment.

Review of the Literature Related to Program Performance Indicators

In 1989, the National Assessment of Vocational Education (NAVE), in the Final Report of the evaluation of programs under the Carl Perkins Act of 1984, addressed the problem of the existing data base for vocational education evaluation. The report said that the data

> ...Are inappropriate for drawing valid estimates of performance by state and rarely contain the types of information needed to fully gauge vocational performance nationally. Recognizing that each state will measure performance in different ways, and comparison across states will be limited to those areas in which similar measures are employed..." (p. 136-137).

NAVE stated the requirements for multiple program performance indicators, and Cowart (1990) said this concept is generally "... supported

in theory but not often in practice" (p. 675). In addition, Cronbach (1982) and specifically the NAVE (1989) report stated, "...vocational education is a complex undertaking with multiple goals and no single measure is likely to be an adequate indicator of program performance" (p. 127). Again, the purpose of this research is to gain data about multiple program performance indicators, specifically those that apply to Tech-Prep programs.

Program performance indicators are sometimes referred to as program performance measures (Hoachlander, 1991). Each are references to an indicator or a program outcome that may be used to indicate program quality, effectiveness, and goal attainment. These terms are not to be confused with a performance standard which is the actual level of attainment required of the program performance indicator (Hoachlander, 1991). For example, a program performance indicator could be students' overall grade point average (GPA), the performance standard could be set to any level appropriate to the program. But, the performance standard would be stated in quantifiable terms, such as, all students must have a minimum of a 3.0 GPA on a 4.0 scale. Therefore, the program performance indicator is the outcome statement and the standard is the level of allowable performance.

This research will identify program performance indicators of Tech-

Prep programs. The determination of the attainment levels of the performance standards is beyond the scope of this research.

Performance Indicators

The literature contains an innumerable amount of program performance indicators which could be applied to vocational, occupational, and Tech-Prep programs. However, there is no evidence in the literature to suggest that prior research has been accomplished to determine the most relevant program performance indicators for Tech-Prep programs.

The selection process of which program performance indicators to utilize in this research was limited to those indicators which directly impact Tech-Prep programs and those included in the following categories: (1) required by the Carl Perkins Act; (2) referenced in the Tech-Prep Education Act; (3) utilized by recognized Tech-Prep programs; and, (4) indicators deemed appropriate by a review of the experts. The following discussion provides a general overview of the extent of the program performance indicators available with an attempt to eliminate those areas where duplication exists.

The 1990 Carl Perkins Act requires that the states address five program performance measures. These include student retention, job placement, competency gains in academics, work or job skill attainment, and vocational competency attainment (Congressional Record, 1990;

Hoachlander, 1991). Some additional suggestions of performance indicators related to the Perkins Act requirement include gains in academic achievement or occupational competencies, program completion rates, high school graduation rates, passing higher level courses, pursuit of further education, school attendance, job earnings, time between "graduation" and employment, and employer satisfaction (Hoachlander, 1991).

Part E of the new Carl Perkins Act is known as the "Tech-Prep Education Act," which has certain performance indicators or requirements for programs. Requirements include: (1) an articulation agreement; (2) two-years secondary and two-years of higher education or an apprenticeship program of at least two-years, with a common core of required proficiency in math, science, communications, and technologies that lead to an associate degree or certification; (3) in-service training for teachers and joint consortium participants; (4) training programs for counselors - recruitment, placement, student completion; (5) equal access; (6) preparatory services for all participants; and, (7) a three-year plan addressing development and implementation for each application. Special consideration is given to programs that: provide for effective employment placement activities or the transfer of students to four-year baccalaureate degree programs; are developed in consultation with

business/industry and labor unions; and address issues of drop-out prevention and the needs of minority youths, at-risk students, and females in non-traditional roles. The Tech-Prep Act has no specific requirements for the evaluation and assessment of Tech-Prep programs per se (Congressional Record, 1990; Department of Education, 1991, p. 51497).

In addition to those examples already mentioned, other examples of program performance indicators discussed in the literature include: public relations (Hammons & Eschenmann, 1990); annual workshop critiques and Stanford Achievement Test scores (Delaware Consortium On Technical Preparation Programs, 1989); graphics communication skills (The North Dakota Tech-Prep Initiative, 1991); portfolios of student work containing projects, writing samples, etc. (Dornsife, 1991); reactions of teachers, counselors, and students ("PACE Program," 1991); student program entry criteria (National Assessment of Vocational Education, 1989); guidance, counseling, and placement services, capacity and condition of facilities and equipment, teacher-pupil ratios, and teacher qualifications (Wasdyke, 1978); learning speeds, styles and backgrounds (Parnell, 1985); professional growth and achievement recognition of staff (Rasor, (1983); per pupil expenditure, class size, teacher preparation, age of textbooks, laboratory facilities, library size (Coleman, 1971).

Tech-Prep Program Focus Components

The literature contains an abundance of program outcomes, categories, and components (Chelimsky, 1978; Congressional Record, 1990; Hoachlander, 1991; Lankard, 1991; Maricopa County Vocational Education Planning Council, 1989; Nagler & Marson, 1979; National Assessment of Vocational Education, 1989; Ory, Harris, Dueitt, & Clark, 1978; Parnell, 1990).

The specificity of focus components selected for use within vocational program evaluation vary depending upon many factors (Wentling, 1975). A few of the factors include the types of programs evaluated, goals of these programs, and the scope of the evaluation conducted, be it an entire organization or department.

The primary sources utilized to select the focus components for this research were: the 1990 Carl Perkins Act and the literature which specifically addressed vocational, occupational, and Tech-Prep program evaluation. The 1990 Carl Perkins Act required that any vocational program which received federal funds must evaluate the following measures: student retention; job placement; competency gains in academics; work or job skill attainment; and vocational competency attainment (Congressional Record, 1990; Hoachlander, 1991).

Focus components. Focus components are areas or components

into which program performance indicators may be grouped to determine the levels of importance or focus that certain areas may contribute to program quality, effectiveness, and goal attainment.

An extensive review of the literature revealed an emergence of six major focus components into which performance indicators may be grouped. The six focus component groupings are: (1) STUDENTS; (2) FACILITATORS; (3) PROFESSIONAL DEVELOPMENT; (4) ATTITUDES/ PERCEPTIONS; (5) CAREERS; and, (6) RESOURCES. The discussion of each of these six focus components utilized in this research follows.

The STUDENTS focus component includes a variety of characteristics or performance indicators that places primary responsibility for attainment upon the student. Examples of the performance indicators include student retention rates, grade point average, and demonstration of job competency.

The FACILITATORS focus component refers to the many individuals, services and programs designed to facilitate the professional development of the students enrolled in Tech-Prep. Examples of the performance indicators include faculty professional development, guidance programs, program access for minority, handicap, and at-risk populations, and placement services.

PROFESSIONAL DEVELOPMENT is the focus component which

encompasses all of the qualifications necessary for the student to enter into their chosen profession. Examples of the performance indicators are gains in academic and vocational skills attainment, number of advanced courses taken, and basic skills attainment.

ATTITUDES/PERCEPTIONS is the focus component which seeks the opinions of all individuals toward the Tech-Prep program. Some examples of performance indicators include the rate of program recognition among students, parents, faculty, business, guidance, and levels of program satisfaction by students, faculty, business, guidance, and alumni.

The next focus component, CAREERS, refers to the labor market indicators of the Tech-Prep program. Examples of the performance indicators for this component are job placement rates, employment levels, and earning levels.

The RESOURCES focus component involve the performance indicators necessary to address physical and monetary assets such as the facilities, equipment, and expenditures. Examples of these performance indicators include quality and quantity of equipment, types of textbooks used, and access to technology and computers.

The focus components discussed meet and exceed the current requirements established by the 1990 Carl Perkins Act for States to

evaluate their vocational programs. To illustrate this point, the Perkins requirements are given followed by the focus components of this study: student retention (STUDENTS); job placement (CAREERS); competency gains in academics (PROFESSIONAL DEVELOPMENT); work or job skill attainment (PROFESSIONAL DEVELOPMENT); and vocational competency attainment (PROFESSIONAL DEVELOPMENT) (Congressional Record, 1990; Hoachlander, 1991). The focus components which exceed the requirements of the Perkins Act include RESOURCES, ATTITUDES/PERCEPTIONS, and FACILITATORS.

The Mailed Survey

The purpose of this section is to present a review of the literature which addresses mailed survey research methodology.

General Information

The literature contains many types and examples of methodologies which can be utilized to gather research data (Best & Kahn, 1989; Dillman, 1978; Fowler, 1984; Huck, Cormier, & Bonds, 1974; Poister, 1978; Worthen & Sanders, 1973). The mailed survey is an important type of research study. However, the ability to draw generalized conclusions and causal inferences must primarily depend upon the research design

and not on the quality of the instrument (Dillman, 1978; Poister, 1978).

Strengths and Weaknesses

A major advantage of mailed surveys is the ability to access a large number of respondents at a relatively low cost in comparison to other research methods (Dillman, 1978; Fowler, 1984; Poister, 1978). Another major advantage is that the mailed survey is self-administered and eliminates the problems associated with interviewer bias. Furthermore, anonymity can bring about more honest responses (Dillman 1978; Poister, 1978; Worthen & Sanders, 1973).

A major weakness of mailed surveys are the frequent low percentage of returns or non-response rates from respondents (Fowler, 1984; Poister, 1978; Worthen & Sanders, 1973). Other weaknesses include the fact that no guarantees exist that the intended respondent understands the questions and that the intended respondent actually completed the form or had someone else complete the form (Worthen & Sanders, 1973). However, the literature contains several references to a method called "Total Survey Design" (Dillman, 1978; Fowler, 1984) which helps to eliminate each of the mentioned weaknesses of mail survey design.

Types of Survey Questions

The literature suggests there are two basic types of questions used

in mailed surveys, although they may have many different names. The types of questions are open and closed. (Fowler, 1984; Poister, 1978).

Open questions allow the researcher to get responses that were not foreseen. Also, responses from open questions tend to be closely related to the actual views of the respondent, and respondents tend to prefer to answer questions in their own words. Open questions become very appropriate whenever the listing of responses on closed question forms are too extensive and impractical to be dealt with by the respondents (Fowler, 1984).

Closed questions are used when the researcher wants to collect ordinal data, which makes it necessary for the categories to be presented to the respondent. In ordinal questioning, the researcher has asked the respondent to make a ranking or selection dependent upon the responses provided for the question. (Fowler, 1984; Poister, 1978).

Types of Response Scales

The response scales are chosen according to what the researcher wants to find out and what types of questions were asked to obtain the answers. Patton (1982) presented four of the more common kinds of questions asked: "behavior, opinion, feeling, and knowledge questions" (p. 144). Once the researcher has decided the kinds of questions to ask the appropriate response scale can be selected. There are many scales

to choose from in the literature, including dichotomous scales, semantic differential scales, and Likart scales (Fowler, 1984; Patton, 1982; Poister, 1978; Worthen & Sanders, 1973).

Chapter Summary

This chapter contains a review of the literature dealing with the major constructs of Tech-Prep program evaluation, program performance indicators (PPI), and mail surveys.

The literature review was representative of the stages of development of the Tech-Prep movement and revealed few references to program evaluation and improvement. Therefore, the literature does support the proposed concept of this research. The major categories used in this review were (a) Tech-Prep defined, (b) background and philosophy, (c) Tech-Prep evaluation models, (d) criticisms of evaluation, (e) program performance indicators, (f) focus components, and, (g) the mailed survey.

Chapter 3

RESEARCH METHODOLOGY

It is important that specific Tech-Prep program performance indicators be identified to assist program directors/coordinators with the improvement of their training programs. However, it has been argued that Tech-Prep programs have not been in existence long enough to develop indicators which could assist in program improvement (Dornsife, 1991). The purpose of this study is to determine the performance indicators of Tech-Prep programs and to determine if common themes exist among program indicators. This section contains information about the population and sample, research design, instrumentation, data collection procedures, and data analysis.

The Population and Sample

The population of this study consists of a screened national listing of existing Tech-Prep programs. The listing was used in the Summer of 1991 by the National Center for Research in Vocational Education's study

entitled "Identification and Dissemination of Articulated Tech-Prep Programs for At-Risk Students" (Hoerner, Clowes, & Impara, 1991). If a respondent indicated they did not have a Tech-Prep program, that name and address was removed from the listing, thus screening the list. The screening process created a listing with a total of 301 Tech-Prep programs with addresses, which are located in 48 States and Puerto Rico.

The random area sample method was selected due to the external validity offered by random selection. The population of the screened Tech-Prep program listing was divided into the five representative regions of the American Vocational Association (AVA). The AVA regions are five geographic divisions of the United States and its Territories, known as Regions I (Northeastern United States), Region II (Southeastern United States including Puerto Rico), Region III (North Central Mid-United States), Region IV (South Central Mid-United States) and Region V (Western United States including Alaska and Hawaii). The total sample population (N=301) was placed into the corresponding AVA Regions and yielded the following: Region I (N=85); Region II (N=71); Region III (N=46); Region IV (N=21); Region V (N=78). A random drawing using the numbers 1 through 5, representing the five regions, was written on equal but separate pieces of paper and placed into a hat with one piece

of paper literally being "drawn from a hat." In each case, any of the Tech-Prep programs located in the five regions had the same probability of being selected. The random drawing produced the number 2, which meant that the entire population of Tech-Prep program's in AVA Region II (Southeastern United States and Puerto Rico) was the population for this research.

The data for this research study were solicited from every Tech-Prep program on the screened listing that has an address corresponding to the randomly selected AVA Region II (N=71). The random area selection process was accomplished in that a generalized representation of the study group was presented.

Research Design

The type of design that is employed in this research falls into the general category of "descriptive" research, where the focus is on describing the way things are as they exist at this time (Best & Kahn, 1989; Poister, 1978). This type of study is often called "Ex Post Facto" or "Nonexperimental" and is defined by Best and Kahn (1989) as follows:

> Descriptive research describes what is, describing, recording, analyzing, and interpreting conditions that exist. It involves some type of comparison or contrast and attempts to discover relationships between existing nonmanipulated variables (p. 24).

Poister (1978) saw the value of "descriptive" research as being the most resource efficient (money and time) in addition to being the most manageable of research designs because it does not require the researcher to inhibit or interfere with the operation of the program or the process being evaluated.

Instrumentation

A mailed questionnaire was developed to obtain data for this research study (see Appendix A). For the purpose of explanation, the questionnaire contained two parts. Part I provided general information and definitions relative to the research study. The information included the title of the research, an explanation of the major research focus, and an explanation of the format of the questionnaire. In addition, Part I contained definitions of terms to assist the respondents in replying to the questionnaire. In order that a general description of the sample population could be provided, Part I also contained questions to solicit general information about the respondents to the questionnaire and the

Tech-Prep programs represented by the surveyed population.

Part II of the questionnaire contained a listing of sixty program performance indicators selected from the review of the literature (See Table 1) which directly impact Tech-Prep programs. Included are those that are: (1) required by the 1990 Carl Perkins Act; (2) referenced by the Tech-Prep Education Act; (3) utilized by recognized Tech-Prep programs; and, (4) deemed necessary by a review of the experts. The respondents were asked to select which program performance indicators they would use to determine the quality, effectiveness, and goal attainment of their Tech-Prep programs. The sixty program performance indicators were listed in a checklist format which enabled the respondents to check either one of the dichotomous variables - "Yes" or "No" - to indicate their preference of indicators. Part II included an open response question enabling the respondents to include any performance indicators not provided in the previous listing. In addition, Part II contained handling instructions for the completed questionnaire; this section contained the name and address of the research study contact person.

The program performance indicators, focus component groupings, and questionnaire were reviewed by a panel of experts in the field of Vocational Program Evaluation from the Division of Vocational Technical Education at Virginia Polytechnic Institute and State University for

TABLE 1

FOCUS COMPONENTS and ASSOCIATED PROGRAM PERFORMANCE INDICATORS

STUDENTS

- School daily attendance rates
- Student retention in the Tech-Prep program
- Student academic progress on grade level
- Student Tech-Prep program completion rate
- Tech-Prep student program progression rate
- High school graduation rate
- Percent of gifted/talented students in Tech-Prep
- Percent of at-risk and/or minority students in Tech-Prep
- Number of students planning to continue their education beyond high school
- Actual numbers of Tech-Prep transfers from high school to post-secondary

RESOURCES

- Students adequately prepared for entry into Tech-Prep program
- Number of mentors available to Tech-Prep students
- Number of Tech-Prep programs offered/available to students
- Number of apprenticeship programs linked to Tech-Prep
- Number of cooperative education programs linked to Tech-Prep
- Teacher/student ratio in Tech-Prep related courses
- Per pupil expenditures for Tech-Prep program
- Financial support provided from business/industry/labor community
- Number of Tech-Prep programs linking post-secondary to 4-year colleges/universities
- Student access and quality of equipment, facilities, and instructional materials (e.g. labs, library, textbooks, computers)

TABLE 1 (continued)

FOCUS COMPONENTS and ASSOCIATED PROGRAM PERFORMANCE INDICATORS

CAREERS

- Job placement rate
- Time to employment (from graduation to on-the-job)
- Rate of employment related to Tech-Prep job preparation
- Entry employment levels
- Rate of job promotion
- Duration of employment
- Job earning (salary) levels
- Employer satisfaction with Tech-Prep graduates job skills
- Student attainment of inter-personal skills
- Student attainment of specific technical skills

PROFESSIONAL DEVELOPMENT

- Applied academics courses successfully completed
- Student portfolios containing projects, writing samples
- Tech-Prep student academic achievement rate at grade level
- Student Tech-Prep job certification rate
- Student demonstration of job competencies
- Number of Tech-Prep courses attempted/completed
- Basic skills test scores
- Advanced skills test scores
- Standardized Achievement Test scores (e.g. SAT, ACT)
- Overall student grade point average or class ranking

TABLE 1 (continued)

FOCUS COMPONENTS and ASSOCIATED PROGRAM PERFORMANCE INDICATORS

ATTITUDES/PERCEPTIONS

- Amount of publicity/media attention
- Rate of positive program recognition among students
- Rate of positive program recognition among facilitators (teachers, guidance)
- Extent to which students' and facilitators' suggestions are incorporated into program
- Business/industry reactions to the overall program
- Recognition program for achievements of students and facilitators
- Motivation and perceptions of Tech-Prep students
- Level of student satisfaction toward academic achievement
- Evaluation of the program by Tech-Prep students and alumni
- Number and frequency of program evaluations

FACILITATORS

- Tech-Prep program recruitment activities (e.g. targeting special groups)
- Career counseling services
- Student placement services
- Follow-up services
- Individualized learning programs (recognizing differences in aptitudes, learning speeds, styles and backgrounds)
- Numbers of at-risk students (e.g. minority, handicapped, disadvantaged, single parent homes, criminal offenders)
- Teacher preparation, qualifications, and certification
- Professional in-service development of staff
- Rates of Tech-Prep program participation (e.g. parents, business community, industrial employers, policy-makers)
- Vocational guidance program services offered

contextual and consensual validity (Best & Kahn, 1989; Poister, 1978). The review of the experts determined if any additional explanation, question, performance indicator, or focus component clarification was warranted. In addition, the expert panel examined the questionnaire for

any ambiguities with any of the listed performance indicators that did not contribute to the questionnaire's purpose (Best & Kahn, 1989). The recommendations of the expert panel were incorporated into the questionnaire (see Appendix A). Additionally, a review of the questionnaire was administered to a select group of graduate students and faculty members who examined the questionnaire for editorial errors and appropriateness of the questionnaire format (Dillman, 1978).

Data Collection Procedure

A modified version of the "Total Survey Design" (Dillman, 1978; Fowler, 1984) methodology was followed to collect the data. Questionnaires were mailed with a specifically addressed cover letter (see Appendix B) signed by the researcher, and using letterhead stationary of Virginia Polytechnic Institute and State University's Division of Vocational and Technical Education. A self-addressed, stamped envelope was included with the questionnaire for its return. Data collection for this research was conducted in the Spring of 1992.

Dillman (1978) attempted to clarify the many necessary techniques which help eliminate the issue of questionnaire non-response by including a quote attributed to Kanuk and Berenson:

> Despite the large number of research studies reporting techniques designed to improve response rates, there is no strong empirical evidence favoring any techniques other than the follow-up and the use of monetary incentives (p. 7).

Both strategies suggested were employed in this study to help improve response rates (Dillman, 1978). First, the follow-up methodology included: (1) after week one - a postcard reminder (See Appendix C) was sent to everyone; (2) after week three - a follow-up letter (See Appendix D) and replacement questionnaire were sent only to the non-respondents.

The monetary incentive was employed by offering each respondent the possibility of being awarded an honorarium if the questionnaire was returned to the sender completed. If the respondent returned the questionnaire within two-weeks of initial mail-out, the respondent's possibility of being awarded the honorarium was doubled. If the respondents returned the completed questionnaire later than two weeks after the initial mailing, they received only one possible opportunity to be awarded the honorarium. The recipient of the honorarium was determined by a random drawing from a container holding the survey code numbers of the respondents. The honorarium was awarded in the Spring of 1992.

The following "Total Survey Design" strategies were also utilized to enhance the questionnaire response rate: (1) an attractive questionnaire

layout that utilized a booklet format and the use of blue stationary for both attractiveness and ease of reading; (2) official sponsorship of the survey which was indicated by the inclusion of the Vocational and Technical Division's logo on the front page of the questionnaire; (3) personalization of correspondence by individually signing each piece with blue ink; (4) the addition of title under sender's name; (5) anonymity and confidentiality were assured by the utilization of code numbers on the questionnaires and guaranteeing that the name of the respondents would never be attached to the questionnaire; and, (6) cover letter's composition which included personalized address, purpose and usefulness of the study, why it was important for the questionnaire to be completed and returned, promise of confidentiality and code number explanation, token award for responding, what to do if questions arise, an appreciation, and signature and title.

Data Analysis

This section describes the procedures utilized to analyze the data collected from the research questionnaire. Data collected were coded in a manner corresponding to the types of responses received.

The dichotomous responses that required a "Yes" or "No" response

were coded with a "1" for a "Yes" response or coded "0" for a "No" response. The remaining data collected were coded for ease of interpretation. These data included the general information questions and the open-ended question.

The data were entered directly into the Number Cruncher Statistical System (NCSS) computer software which was used to calculate and manipulate the responses.

The types of statistical analysis utilized in research are dependent upon many factors, such as the types of research performed and types of questions to be answered from the research. For the selection of the best methods, Best and Kahn (1989) recommended the following:

> A statistical process should not be employed in the analysis of data unless it adds clarity or meaning to the analysis of data. It should not be used as window dressing to impress the reader (p. 260).

Descriptive statistics including proportions, percentages, ratios and rates, are utilized to describe the collected data. These relational measures can be used in summary fashion to express the frequency of cases in a given category, as one quantity relates to another quantity. In addition, a given relational measure can be computed for each case listed in the data set. A given relational measure can also be used when appropriate measures of central tendency are employed to examine the data.

Chapter Summary

This chapter examined the research methodology to be utilized for this study. The discussion included the population and sample, the advantages and disadvantages of descriptive research, instrumentation, data collection procedures, and data analysis.

Chapter 4

DATA ANALYSIS AND FINDINGS

This chapter describes the Tech-Prep program performance indicators of the population and reports the data analysis of the research questions of this study. The data analysis and the discussion of findings in this chapter consist of four major sections. The first of these sections describes the respondents who participated in this research. The remaining sections report the statistical analysis running parallel to each of the three research questions.

A Description of the Respondents

Sixty-seven Tech-Prep program directors/coordinators constitute the population for this study. These program directors/coordinators are geographically located throughout the Southeastern United States and Puerto Rico. Slightly over sixty-eight percent of the respondents have been Tech-Prep directors/coordinators for two years or less (See Table 2A) with approximately the same amount working in the position

TABLE 2A

GENERAL PROGRAM INFORMATION

Question	Percentage of Responses
How long have you been a Tech-Prep director/ coordinator?	
• Less than one year	36.8%
• Between one and two years	28.0%
• Between two and three years	19.3%
• More than three years	15.9%
Your position as Tech-Prep director/coordinator is:	
• a part-time position	68.4%
• a full-time position	29.8%
• neither	1.8%
Your immediate supervisor works in:	
• a secondary school setting	28.6%
• a post-secondary school setting	62.5%
• both secondary and post-secondary	8.9%
Which category best describes your professional education background?	
• Academic	55.4%
• Vocational	44.6%
What stage of development best describes your Tech-Prep program?	
• Planning Stage (establishing committees/ consortium members)	12.3%
• Developmental Stage (writing curriculum/producing marketing tools)	35.1%
• Implementation Stage (curriculum written/active student recruitment)	38.6%
• Advanced Stage (students enrolled/graduating from program)	14.0%

TABLE 2A (continued) GENERAL PROGRAM INFORMATION	
Question	**Percentage of Responses**
Program Performance Indicator data should be used to evaluate/compare:	
• Tech-Prep students with all non-Tech-Prep students	41.8%
• Tech-Prep students only	30.9%
• Tech-Prep students with College Prep students	14.6%
• Tech-Prep students with General Education students	5.5%
• Tech-Prep students with Vocational Program students	7.3%

part-time. A majority of the directors/coordinators have immediate supervisors who work in a post-secondary school setting. In describing the development stage of their program, over seventy-three percent of the directors/coordinators stated that their program was either in the developmental or implementation stage, with the remainder stating their programs were either in the planning or advanced stages of development. The data show an equitable mixture of academic and vocational professional backgrounds of the Tech-Prep program directors/coordinators responding (See Table 2B for additional general Tech-Prep program information).

Seventy-one questionnaires were initially mailed to identified Tech-Prep program directors/coordinators. Fifty-seven questionnaires were collected, coded, and analyzed. Table 3 provides a response breakdown.

TABLE 2B	
ADDITIONAL GENERAL PROGRAM INFORMATION	
Question	**Percentage of YES Responses**
To date, does your program or consortium:	
• have a written and signed Tech-Prep program articulation agreement(s)?	82.5%
• provide for in-service training for Tech-Prep teachers and joint consortium participants?	83.9%
• consist of an articulated educational program of 2 years high school and 2 years post-secondary preparation which includes a common core of math, science, communications, and technologies designed to lead to an associate degree or certificate in a specific career field?	76.8%
• provide for equal access to all students?	98.2%
• provide preparatory services for all participants?	92.6%
• provide for training of counselors in the areas of recruitment, placement, and student retention?	76.4%
• work within the framework of a 3-year developmental plan?	73.2%
• have an effective employment placement activity?	56.4%
• transfer students to 4-year baccalaureate degree programs?	69.6%
• consult with business/industry and labor unions?	96.4%
• address the issues of drop-out prevention and the needs of minority youths, at-risk students, and females in non-traditional roles?	81.8%
• have the computer capability to track Tech-Prep students in secondary through post-secondary training?	41.5%
• have an established evaluation plan that provides data used to indicate program quality, effectiveness, and goal attainment?	50.0%

A total of sixty-one questionnaires were returned: two were not-reachable, two were not-eligible, and two were unusable.

TABLE 3
QUESTIONNAIRE RESPONSE BREAKDOWN

Type of Response	Number
Questionnaires Mailed	71
• Returned as Not-reachable	- 2
• Returned as Not-eligible	- 2
NUMBER IN SAMPLE	67
Questionnaire Results from Known Eligibles	
• Completed	57
• Declined to Participate	+ 2
• Not Returned	+ 8
NUMBER IN SAMPLE	67

The two not-reachable questionnaires were returned by the postal service marked "return to sender - individual is no longer at this address" with no forwarding address provided. The "return to sender" for these two individuals was also confirmed by the return of the second follow-up postcard which was mailed one week after the initial questionnaire mailing. The return of these two survey instruments could be due to one of two things. The individuals could have left their position as Tech-Prep director/coordinator due to the elimination of the program, or replaced by another director/coordinator with the Tech-Prep program still in operation.

The researcher was unable to determine which of the two scenarios applied in this case.

Two names were removed from the initial mailing list as part of the screening process to remove those not-eligible to respond. The first name was removed upon receipt of a memo attached to the questionnaire which identified the individual who was the consortium director of the area. This respondent asked that her name be removed because the consortium director had responded to the questionnaire. The second name was removed upon receipt of a long-distance phone call from a prospective respondent asking that her name be removed from the listing. This individual also identified an area Tech-Prep director/coordinator who had previously responded to the questionnaire. In both instances, questionnaires were mailed to different respondents at identical mailing addresses.

The response rate to the questionnaire was 85 percent. This rate was calculated using Dillman's (1978, p. 20) formula:

$$\text{Response rate} = \frac{\text{Number of Completed Questionnaires}}{\text{Sample number - (not-eligible + not-reachable)}}$$

$$\text{85 percent} = \frac{57}{71 - (2 + 2)}$$

In addition, two of the returned questionnaires were unusable. The two unusable responses were accompanied by written explanations by the respondents explaining why they chose not to respond. One of these respondents began to answer the questions in the questionnaire and then abruptly stopped and wrote the following in the margin of the questionnaire:

> I can't answer any further at this point. We have had a Tech-Prep program that was initiated by the college in 1988. We are backing up to get the support of the H.S. We have had several students go through the program with great success. We consider this insignificant [questionnaire?] since we enroll about 10,000 [program name] grads in each quarter and most of them have never heard of Tech-Prep. [added by researcher].

The other respondent wrote a letter and enclosed it within the questionnaire. The letter illustrates this individual's frustration at being a Tech-Prep project director "for this year only for a planning grant" and explaining that responding to the questionnaire would be inappropriate for this type of grant. The letter provided additional insight about the types of administrative problems concerning Tech-Prep programs such as the "demands of HUGE amounts of time from people terribly overworked" coupled with "inadequate funding for these positions...complicated by state budget cuts." The unusable questionnaires were not complete including the section for the identification of program performance indicators.

After three mailings, a total of eight Tech-Prep directors/coordinators had not returned their questionnaires for inclusion in this study.

Analysis of Research Question One

From a listing of program performance indicators, respondents were asked to select which ones they, as Tech-Prep program directors/ coordinators, would use to determine program quality, effectiveness, and goal attainment of their Tech-Prep programs. The respondents were given the opportunity to include any additional program performance indicators which were not included in the initial listing.

Data Analysis

Each respondent was asked to check either "Yes" or "No" for each of the listed sixty program performance indicators. The program performance indicator data are listed in Table 4, which denotes the Tech-Prep coordinators/directors reaction to the "Yes" response for each program performance indicator. The following is a discussion of the descriptive statistics found in Table 4.

Table 4 consists of seven columns. The first column lists each program performance indicator in sequence beginning with the most

significant mean score and followed in descending order. The mean ($\bar{x}$) values of the "Yes" responses, found in column two, were multiplied by 100 and rounded to the nearest one-tenth of a percent. The third column presents the sum total of the respondents who checked "Yes" responses (ΣY) for a given indicator. On a few questionnaires the respondents failed to enter either a "Yes" or "No" response for a listed performance indicator; column four reflects this number as a non-response (NR). Column five is the total number of data entries for each indicator and is denoted as the sum of the frequencies (Σf). Column six provides information on the probability estimate - standard error of the mean (SE). SE is the standard deviation of the distribution of sample estimates of means that would be formed if an infinite number of samples of a given size from a similar population were to be drawn. Once the value of the standard error has been estimated, one can suggest that 67 percent of the means of samples of a given size and design will fall within the range of $\pm$ 1 standard error of the true population mean. If the standard error of estimate is doubled then the value will fall within 95 percent of such samples ($\pm$ 2 standard errors) and is often reported as "confidence interval" around the sample estimate (Fowler, 1984, p. 36). The value given in Table 4 is within a "confidence interval" of 95 percent (2*SE). The last column is an alphabet character representing the focus

component (FC) for each program performance indicator: S - STUDENTS; R - RESOURCES; C - CAREERS; P - PROFESSIONAL DEVELOPMENT; A - ATTITUDES/PERCEPTIONS; and, F - FACILITATORS.

It should be noted the selection of performance indicators utilized dichotomous variables (Yes and No), and coupled with a questionnaire response rate of 85 percent suggests that caution be utilized when interpreting these data. For example, the non-response rate could theoretically increase or decrease the existing mean scores ± 15 percent.

Program Performance Indicator Data

Tech-Prep directors/coordinators' responses to the selected program performance indicators which they would use to determine the quality, effectiveness, and goal attainment of their program ranged from 100 percent to 43.9 percent agreement (See Table 4). Two performance indicators shared the 100 percent agreement and these were: (1) Student Tech-prep program completion rate and, (2) Tech-prep student academic achievement rate at grade level. The indicator receiving the least amount of agreement among respondents with a 43.9 percent mean score was: Percent of gifted/talented students in Tech-Prep.

The raw data suggest that the responding Tech-Prep directors/coordinators reach an agreement level of 50 percent or greater on fifty-eight of the sixty selected program performance indicators (96.7

TABLE 4

DESCRIPTIVE STATISTICS OF PROGRAM PERFORMANCE INDICATORS

Program Performance Indicators	x̄*100	ΣY	NR	Σf	2*SE	FC
Student Tech-Prep program completion rate	100	57	0	57	0.0	S
Tech-Prep student academic achievement rate at grade level	100	56	1	56	0.0	P
Student retention in the Tech-Prep program	98.2	56	0	57	3.5	S
Student academic progress on grade level	98.2	56	0	57	3.5	S
Student attainment of specific technical skills	98.2	55	1	56	3.6	C
Business/Industry reactions to the overall program	98.2	55	1	56	3.6	A
Actual numbers of Tech-Prep transfers from high school to post-secondary	96.5	55	0	57	4.9	S
Evaluation of the program by Tech-Prep students and alumni	96.5	55	0	57	4.9	A
Tech-Prep student program progression rate	94.6	52	2	55	6.2	S
Number of students planning to continue their education beyond high school	92.9	53	0	57	6.8	S
Employer satisfaction with Tech-Prep graduates job skills	92.9	53	0	57	6.8	C
Student demonstration of job competencies	92.9	53	0	57	6.8	P
Professional in-service development of staff	92.9	53	0	57	6.8	F
Career counseling services	92.9	53	0	57	6.8	F
Student attainment of inter-personal skills	91.1	51	1	56	7.7	C
Student placement services	91.1	51	1	56	7.7	F
Rate of employment related to Tech-Prep job preparation	89.5	51	0	57	8.2	C
Level of student satisfaction toward academic achievement	89.5	51	0	57	8.2	A
Follow-up services	89.5	51	0	57	8.2	F
High school graduation rate	89.3	50	1	56	8.2	S
Applied academics courses successfully completed	89.3	50	1	56	8.2	P
Students adequately prepared for entry into Tech-Prep program	87.7	50	0	57	8.8	R

TABLE 4 (continued)

DESCRIPTIVE STATISTICS OF PROGRAM PERFORMANCE INDICATORS

Program Performance Indicators	x̄*100	ΣY	NR	Σf	2*SE	FC
Job placement rate	87.7	50	0	57	8.8	C
Basic skills test scores	87.7	50	0	57	8.8	P
Rate of positive program recognition among students	87.7	50	0	57	8.8	A
Rates of Tech-Prep program participation (e.g. parents, business community, industrial employers, policy-makers)	87.7	50	0	57	8.8	F
Tech-Prep program recruitment activities (e.g. targeting special groups)	87.3	48	2	55	9.1	F
Vocational guidance program services offered	85.9	49	0	57	9.3	F
Rate of positive program recognition among facilitators (teachers, guidance)	85.9	49	0	57	9.3	A
Motivation and perceptions of Tech-Prep students	85.7	48	1	56	9.4	A
Entry employment levels	82.5	47	0	57	10.2	C
Teacher preparation, qualifications, and certification	81.8	45	2	55	10.5	F
Student access and quality of equipment, facilities, and instructional materials (e.g. labs, library, textbooks, computers)	80.7	46	0	57	10.5	R
Advanced skills test scores	78.6	44	1	56	11.1	P
Extent to which students' and facilitators' suggestions are incorporated into program	78.6	44	1	56	11.1	A
Individualized learning programs (recognizing differences in aptitudes, learning speeds, styles and backgrounds)	78.6	44	1	56	11.1	F
Student Tech-Prep job certification rate	78.2	43	2	55	11.2	P
Percent of at-risk and/or minority students in Tech-Prep	77.2	44	0	57	11.2	S
School daily attendance rates	76.8	43	1	56	11.4	S
Number of Tech-Prep courses attempted/completed	76.8	43	1	56	11.4	P

TABLE 4 (continued)

DESCRIPTIVE STATISTICS OF PROGRAM PERFORMANCE INDICATORS

Program Performance Indicators	$\bar{x}*100$	ΣY	NR	Σf	2*SE	FC
Overall student grade point average or class ranking	75.4	43	0	57	11.5	P
Time to employment (from graduation to on-the-job)	73.7	42	0	57	11.8	C
Job earning (salary) levels	73.7	42	0	57	11.8	C
Numbers of at-risk students (e.g. minority, handicapped, disadvantaged, single parent homes, criminal offenders)	73.2	41	1	56	11.9	F
Number of Tech-Prep programs linking post-secondary to 4-year colleges/ universities	73.2	41	1	56	11.9	R
Recognition programs for achievements of students and facilitators	71.9	41	0	57	12.0	A
Number of Tech-Prep programs offered/available to students	66.7	38	0	57	12.6	R
Number of cooperative education programs linked to Tech-Prep	66.1	37	1	56	12.8	R
Number and frequency of program evaluations	64.9	37	0	57	12.8	A
Rate of job promotion	61.4	35	0	57	13.0	C
Financial support provided from business/industry/labor community	60.7	34	1	56	13.2	R
Standardized Achievement Test scores (e.g. SAT, ACT)	59.7	34	0	57	13.2	P
Amount of publicity/media attention	59.7	34	0	57	13.2	A
Per pupil expenditures for Tech-Prep program	58.2	32	2	55	13.4	R
Duration of employment	58.2	32	2	55	13.4	C
Teacher/student ratio in Tech-Prep related courses	57.1	32	1	56	13.3	R
Student portfolios containing projects, writing samples	54.4	31	0	57	13.3	P
Number of mentors available to Tech-Prep students	51.8	29	1	56	13.5	R
Number of apprenticeship programs linked to Tech-Prep	45.6	26	0	57	13.3	R
Percent of gifted/talented students in Tech-Prep	43.9	25	0	57	13.3	S

percent). These indicators are listed in Table 4 with a mean score range of 50 to 100 percent.

Considering the situation wherein all of the non-respondents would have selected "No" on each of the performance indicators, the mean score for each indicator would be reduced by 15 percentage points. Even in this situation, the data suggest majority agreement among directors/coordinators on forty-eight of the sixty indicators (80 percent). These indicators are those with a mean score of 65 percent or greater listed in Table 4.

Performance Indicators Added By Respondents

The questionnaire provided the Tech-Prep program directors/coordinators with the opportunity to respond to an "open-ended" question which asked for performance indicators which they felt should have been included but were omitted from the list of sixty. Fourteen of the fifty-seven respondents (24.6 percent) made some type of comment within this section, however, only four respondents offered additional performance indicators. The following is a listing of the additional suggested performance indicators:

- Successful completion of a national exam for licensing (i.e., Board of Nursing)*
- Increase/decrease in Tech-Prep targeted areas of enrollment*

- Responsiveness of secondary and post-secondary [sic] to curriculum changes
- Graduate intentions - follow-up 1 year/3 years/ 5 years after graduation at secondary level
- Physics, chemistry skills documented mastery*
- Number of students enrolled in grade level of above in english, math, science, and social studies courses with documentation of 80 percent skill mastery
- Algebra I, II, and geometry completers with grade level skill mastery*
- Objective documentation of vocational technical skill mastery in every course as evidenced by pre/post testing*
- Drop-out rates**
- Number of students placed in remediation at post-secondary institutions

The suggested performance indicators without an asterisk or double asterisk are unique to the original listing. The indicators followed by an asterisk are re-worded duplicates of indicators from the original listing. For example, the successful completion of a national exam for licensing (i.e., Board of Nursing) suggests that it could be stated as an original indicator "Advanced skills test scores." The double asterisk denotes an

inverse of an original performance indicator. In this example, drop-out rates is the inverse of the "student retention" indicator. There are three additional performance indicators which appear to be unique to the original questionnaire listing.

Analysis of Research Question Two

The second research question sought to examine the extent to which Tech-Prep directors/coordinators agree on selected performance indicators that can be used as a basis for program comparison and/or evaluation. This study sought to examine if agreement could be reached among "stakeholders" (directors/coordinators) as to which program performance indicators may be used for program comparison and/or evaluation. In this analysis "agreement" is interpreted as a majority (50 percent or greater) consensual agreement among the respondent Tech-Prep directors/coordinators.

Agreement On Program Performance Indicators

The discussion of agreement on performance indicators among Tech-Prep directors/coordinators consists of an examination of the data from three perspectives. First, the data are discussed at "face value" or consensual agreement as reported by the respondents. Next, the data

are calculated considering the standard error of the mean (SE). Lastly, the data are discussed using a conservative strategy which considers the worst case scenario, taking into consideration both the standard error of the mean (SE) and the non-response rate (NRR) of 15 percentage points. See Tables 4 and 5 for the following discussion.

When examining the consensual values in both sum of the "Yes" responses (ΣY) and mean scores ($\bar{x}*100$), the data suggests agreement on 96.7 percent of the selected program performance indicators. Fifty-eight of sixty of the performance indicators have calculated mean scores of 50 percent or greater. This is representative of a minimum 29 of 57 "Yes" responses checked by the program directors/coordinators.

The data suggest agreement on a majority of the selected program performance indicators (See Table 5, column 2) when the data are examined to insure a 95 percent confidence at the lower boundary. This adjusted mean value is calculated by subtracting two standard errors of the mean (SE) from the mean score ($\bar{x}*100$). Forty-nine of sixty (81.7 percent) of the performance indicators have an adjusted mean score of 50 percent or greater.

Using a conservative strategy to analyze the data suggests agreement on a majority of the selected performance indicators. This strategy subtracts two standard errors of the mean (2*SE) and the non-

TABLE 5

ANALYSIS OF EXTENT OF AGREEMENT ON PROGRAM PERFORMANCE INDICATORS

Program Performance Indicators	x*100	x-(2*SE)	x-(NRR+(2*SE))
Student Tech-Prep program completion rate	100	100	85.0
Tech-Prep student academic achievement rate at grade level	100	100	85.0
Student retention in the Tech-Prep program	98.2	94.7	79.7
Student academic progress on grade level	98.2	94.7	79.7
Student attainment of specific technical skills	98.2	94.7	79.6
Business/Industry reactions to the overall program	98.2	94.7	79.6
Actual numbers of Tech-Prep transfers from high school to post-secondary	96.5	91.6	76.6
Evaluation of the program by Tech-Prep students and alumni	96.5	91.6	76.6
Tech-Prep student program progression rate	94.6	88.4	73.4
Number of students planning to continue their education beyond high school	92.9	86.1	71.1
Employer satisfaction with Tech-Prep graduates job skills	92.9	86.1	71.1
Student demonstration of job competencies	92.9	86.1	71.1
Professional in-service development of staff	92.9	86.1	71.1
Career counseling services	92.9	86.1	71.1
Student attainment of inter-personal skills	91.1	83.4	68.4
Student placement services	91.1	83.4	68.4
Rate of employment related to Tech-Prep job preparation	89.5	81.3	66.3
Level of student satisfaction toward academic achievement	89.5	81.3	66.3
Follow-up services	89.5	81.3	66.3
High school graduation rate	89.3	81.1	66.1
Applied academics courses successfully completed	89.3	81.1	66.1
Students adequately prepared for entry into Tech-Prep program	87.7	78.9	63.9

TABLE 5 (continued)

ANALYSIS OF EXTENT OF AGREEMENT ON PROGRAM PERFORMANCE INDICATORS

Program Performance Indicators	x*100	x-(2*SE)	x-(NRR+(2*SE))
Job placement rate	87.7	78.9	63.9
Basic skills test scores	87.7	78.9	63.9
Rate of positive program recognition among students	87.7	78.9	63.9
Rates of Tech-Prep program participation (e.g. parents, business community, industrial employers, policy-makers)	87.7	78.9	63.9
Tech-Prep program recruitment activities (e.g. targeting special groups)	87.3	78.2	63.2
Vocational guidance program services offered	85.9	76.6	61.6
Rate of positive program recognition among facilitators (teachers, guidance)	85.9	76.6	61.6
Motivation and perceptions of Tech-Prep students	85.7	76.3	61.3
Entry employment levels	82.5	72.3	57.3
Teacher preparation, qualifications, and certification	81.8	71.3	56.3
Student access and quality of equipment, facilities, and instructional materials	80.7	70.2	55.2
(e.g. labs, library, textbooks, computers)	78.6	70.1	52.1
Advanced skills test scores			
Extent to which students' and facilitators' suggestions are incorporated into program	78.6	70.1	52.1
Individualized learning programs (recognizing differences in aptitudes, learning speeds, styles and backgrounds)	78.6	70.1	52.1
Student Tech-Prep job certification rate	78.2	67.0	52.0
Percent of at-risk and/or minority students in Tech-Prep	77.2	66.0	51.0
School daily attendance rates	76.8	65.4	50.4
Number of Tech-Prep courses attempted/completed	76.8	65.4	50.4

TABLE 5 (continued)

ANALYSIS OF EXTENT OF AGREEMENT ON PROGRAM PERFORMANCE INDICATORS

Program Performance Indicators	x*100	x-(2*SE)	x-(NRR+(2*SE))
Overall student grade point average or class ranking	75.4	63.9	48.9
Time to employment (from graduation to on-the-job)	73.7	61.9	46.9
Job earning (salary) levels	73.7	61.9	46.9
Numbers of at-risk students (e.g. minority, handicapped, disadvantaged, single parent homes, criminal offenders)	73.2	61.3	46.3
Number of Tech-Prep programs linking post-secondary to 4-year colleges/ universities	73.2	61.3	46.3
Recognition programs for achievements of students and facilitators	71.9	59.9	44.9
Number of Tech-Prep programs offered/available to students	66.7	54.1	39.1
Number of cooperative education programs linked to Tech-Prep	66.1	53.3	38.3
Number and frequency of program evaluations	64.9	52.1	37.1
Rate of job promotion	61.4	48.4	33.4
Financial support provided from business/industry/labor community	60.7	47.5	32.5
Standardized Achievement Test scores (e.g. SAT, ACT)	59.7	46.5	31.5
Amount of publicity/media attention	59.7	46.5	31.5
Per pupil expenditures for Tech-Prep program	58.2	44.8	29.8
Duration of employment	58.2	44.8	29.8
Teacher/student ratio in Tech-Prep related courses	57.1	43.7	28.7
Student portfolios containing projects, writing samples	54.4	41.1	26.1
Number of mentors available to Tech-Prep students	51.8	38.3	23.3
Number of apprenticeship programs linked to Tech-Prep	45.6	32.3	17.3
Percent of gifted/talented students in Tech-Prep	43.9	30.6	15.6

response rate (NRR) of -15 percentage points from the performance indicator mean score (see Table 5, column 3). Forty of sixty (66.7 percent) of the performance indicators have calculated mean scores of 50 percent or greater using this conservative strategy.

Analysis of Research Question Three

The third research question examined is: Which performance indicators, when grouped into focus components, are perceived to be important by Tech-Prep directors/coordinators? The sixty program performance indicators selected for this study are grouped into six focus components with ten indicators in each: STUDENTS, RESOURCES, CAREERS, PROFESSIONAL DEVELOPMENT, ATTITUDES/ PERCEPTIONS, and FACILITATORS. The focus component (FC) column in Table 4 indicates the focus component for each performance indicator.

As noted in Table 6 and Figure 1, the STUDENTS focus component had the largest range of mean values, 56.1 percentage points. The FACILITATORS component had the smallest range at 19.7 percentage points (73.2 - 92.9 percent), of the focus component groups.

On the basis of their mean scores, the performance indicators have been divided into quartiles and grouped according to their focus

TABLE 6

ACCEPTANCE RATES OF FOCUS COMPONENTS AND ASSOCIATED PROGRAM PERFORMANCE INDICATORS

Focus Components and Program Performance Indicators	Rates
STUDENTS	
• Student Tech-Prep program completion rate	100.0
• Student academic progress on grade level	98.2
• Student retention in the Tech-Prep program	98.2
• Actual numbers of Tech-Prep transfers from high school to post-secondary	96.5
• Tech-Prep student program progression rate	94.6
• Number of students planning to continue their education beyond high school	92.9
• High school graduation rate	89.3
• Percent of at-risk and/or minority students in Tech-Prep	77.2
• School daily attendance rates	76.8
• Percent of gifted/talented students in Tech-Prep	43.9
RESOURCES	
• Students adequately prepared for entry into Tech-Prep program	87.7
• Student access and quality of equipment, facilities, and instructional materials (e.g. labs, library, textbooks, computers)	80.7
• Number of Tech-Prep programs linking post-secondary to 4-year colleges/universities	73.2
• Number of Tech-Prep programs offered/available to students	66.7
• Number of cooperative education programs linked to Tech-Prep	66.1
• Financial support provided from business/industry/ labor community	60.7
• Per pupil expenditures for Tech-Prep program	58.2
• Teacher/student ratio in Tech-Prep related courses	57.1
• Number of mentors available to Tech-Prep students	51.8
• Number of apprenticeship programs linked to Tech-Prep	45.6

TABLE 6 (continued)

ACCEPTANCE RATES OF FOCUS COMPONENTS AND ASSOCIATED PROGRAM PERFORMANCE INDICATORS

Focus Components and Program Performance Indicators	Rates
CAREERS	
• Student attainment of specific technical skills	98.2
• Employer satisfaction with Tech-Prep graduates job skills	92.9
• Student attainment of inter-personal skills	91.1
• Rate of employment related to Tech-Prep job preparation	89.5
• Job placement rate	87.7
• Entry employment levels	82.5
• Time to employment (from graduation to on-the-job)	73.7
• Job earning (salary) levels	73.7
• Rate of job promotion	61.4
• Duration of employment	58.2
PROFESSIONAL DEVELOPMENT	
• Tech-Prep student academic achievement rate at grade level	100
• Student demonstration of job competencies	92.9
• Applied academics courses successfully completed	89.3
• Basic skills test scores	87.7
• Advanced skills test scores	78.6
• Student Tech-Prep job certification rate	78.2
• Number of Tech-Prep courses attempted/completed	76.7
• Overall student grade point average or class ranking	75.4
• Standardized Achievement Test scores (e.g. SAT, ACT)	59.6
• Student portfolios containing projects, writing samples	54.4

TABLE 6 (continued)

ACCEPTANCE RATES OF FOCUS COMPONENTS AND ASSOCIATED PROGRAM PERFORMANCE INDICATORS

Focus Components and Program Performance Indicators	Rates
ATTITUDES/PERCEPTIONS	
• Business/industry reactions to the overall program	98.2
• Evaluation of the program by Tech-Prep students and alumni	96.5
• Level of student satisfaction toward academic achievement	89.5
• Rate of positive program recognition among students	87.7
• Rate of positive program recognition among facilitators (teachers, guidance)	85.9
• Motivation and perceptions of Tech-Prep students	85.7
• Extent to which students' and facilitators' suggestions are incorporated into program	78.6
• Recognition programs for achievements of students and facilitators	71.9
• Number and frequency of program evaluations	64.9
• Amount of publicity/media attention	59.6
FACILITATORS	
• Professional in-service development of staff	92.9
• Career counseling services	92.9
• Student placement services	91.1
• Follow-up services	89.5
• Rates of Tech-Prep program participation (e.g. parents, business community, industrial employers, policy-makers)	87.7
• Tech-Prep program recruitment activities (e.g. targeting special groups)	87.3
• Vocational guidance program services offered	85.9
• Teacher preparation, qualifications, and certification	81.8
• Individualized learning programs (recognizing differences in aptitudes, learning speeds, styles and backgrounds)	78.6
• Numbers of at-risk students (e.g. minority, handicapped, disadvantaged, single parent homes, criminal offenders)	73.2

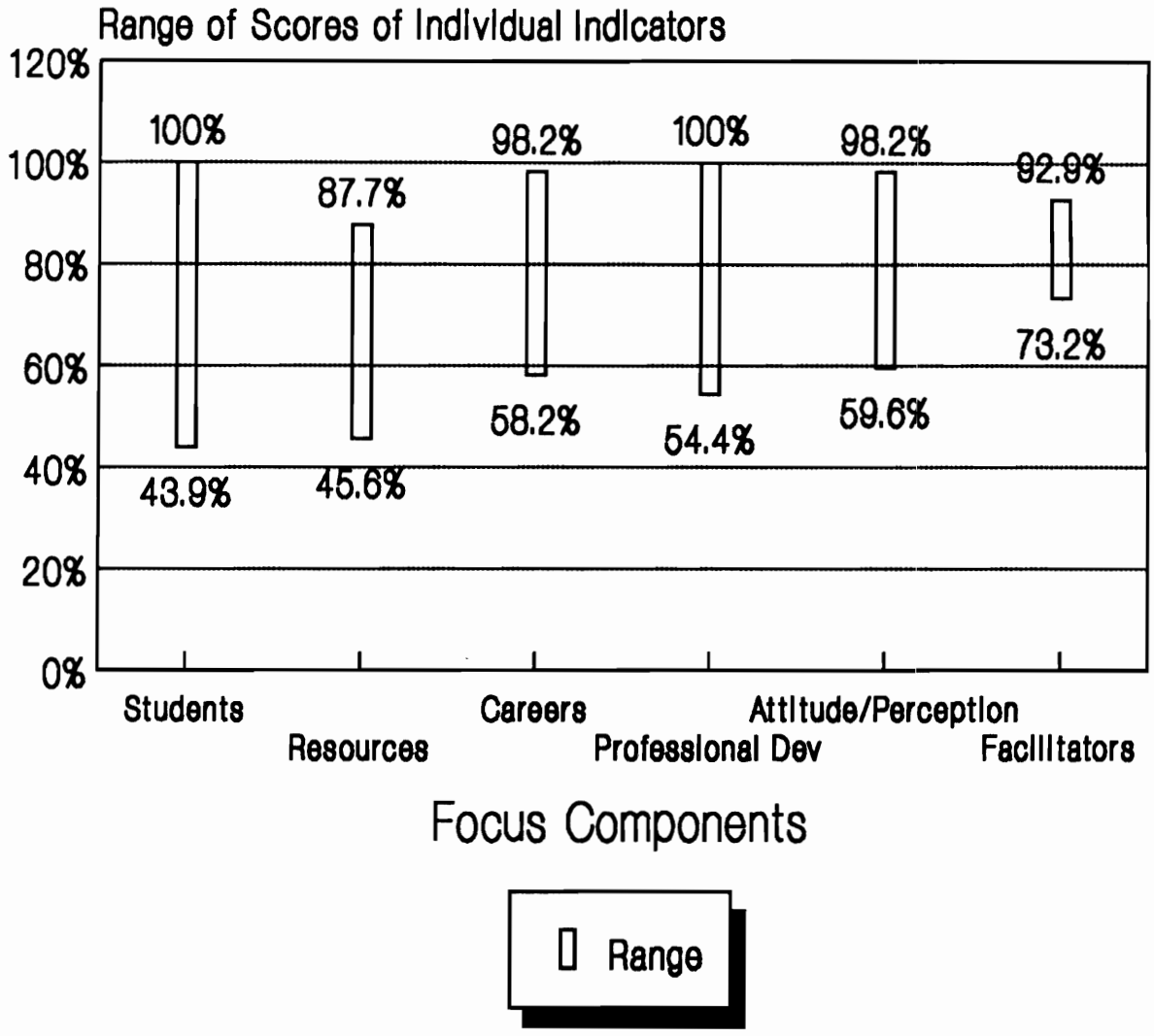


FIGURE 1

RANGE OF SCORES
FOR PROGRAM PERFORMANCE INDICATORS
BY FOCUS COMPONENTS

component. With sixty performance indicators, each quartile consists of fifteen indicators.

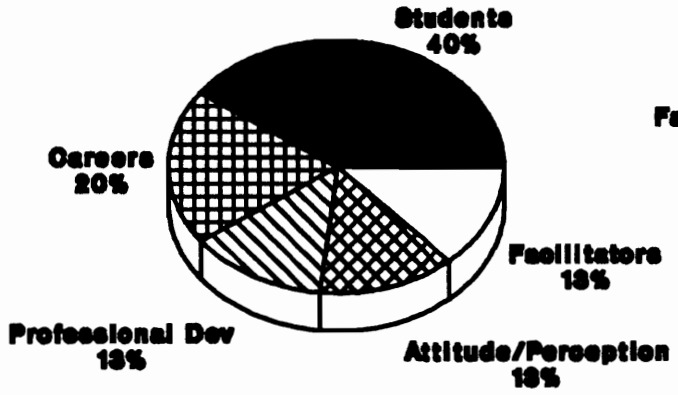
As shown in Figure 2A, the largest focus component represented in the upper quartile (Quartile Four) is STUDENTS, with six of the fifteen indicators (40 percent). Notably, Quartile Four includes no RESOURCES indicators. Analysis of Third Quartile data indicates FACILITATORS, closely followed by ATTITUDES/PERCEPTIONS, as the predominant focus components. Second Quartile figures, see Figure 2B, exhibit the most balanced of focus component representation. The lower quartile (Quartile One) is dominated by the RESOURCES focus component, containing seven of the fifteen lowest scoring performance indicators. No FACILITATORS indicators are represented in the First Quartile.

Chapter Summary

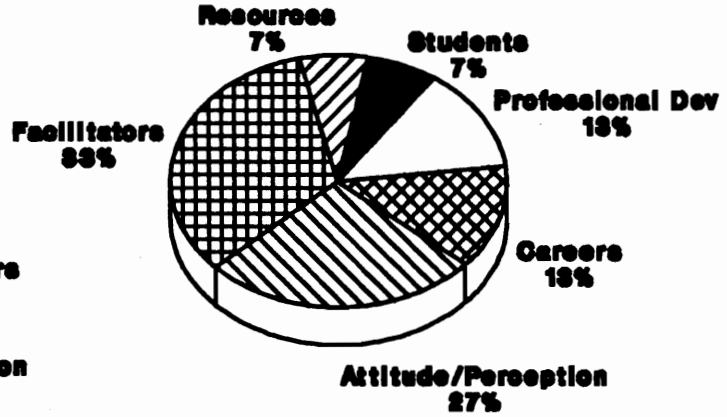
The statistical analysis of the data yielded the following results:

1. Tech-Prep program directors/coordinators statistically agree on the majority of selected program performance indicators which determine program quality, effectiveness, and the goal attainment of their Tech-Prep programs.

2. Further analysis revealed the extent to which Tech-Prep



Fourth Quartile



Third Quartile

FIGURE 2A

DISTRIBUTION OF PROGRAM PERFORMANCE INDICATORS WITHIN FOCUS COMPONENT GROUPS BY QUARTILES

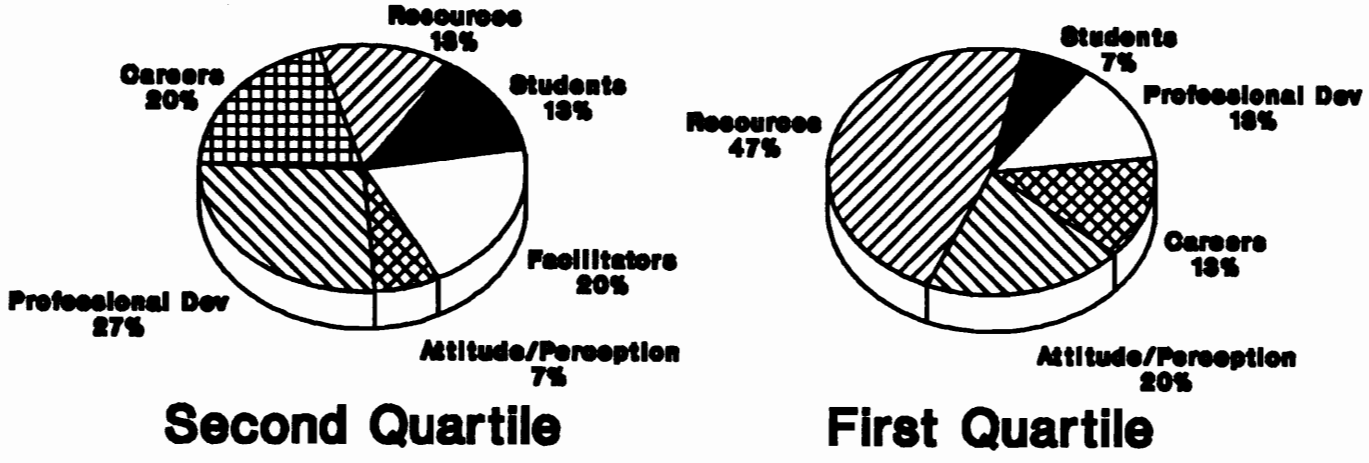


FIGURE 2B

DISTRIBUTION OF PROGRAM PERFORMANCE INDICATORS WITHIN FOCUS COMPONENT GROUPS BY QUARTILES

directors/coordinators agree on selected performance indicators for use in program comparison and/or evaluation. The extent of data examination includes: consensual values, consideration of the standard error of the mean value to insure a lower boundary with a 95 percent level of confidence, and non-response rate plus two standard errors of the mean. In all three examinations the data statistically demonstrates agreement on the majority of selected program performance indicators for use in program comparison and/or evaluation.

3. The data suggest the STUDENTS focus component is perceived as the most important by Tech-Prep directors/ coordinators on the basis of mean scores and quartile distribution. Using the same criteria, the CAREERS, PROFESSIONAL DEVELOPMENT, ATTITUDE/PERCEPTIONS, and FACILITATORS focus components are perceived as equally important and, the RESOURCES focus component is perceived as the least important.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The preceding chapters of this study presented the problem, reviewed available literature regarding Tech-Prep program evaluation and program performance indicators, described the research methodology, and analyzed the data. This chapter summarizes the study and presents its conclusions and recommendations.

Summary

This study was designed as a pilot inquiry to determine which program performance indicators Tech-Prep directors/coordinators would use to determine the Tech-Prep program quality, effectiveness, and goal attainment. An extensive review of relevant literature suggested the following:

1. Program performance indicators are lacking, yet necessary, in order to determine the quality, effectiveness, and goal attainment of vocational programs (Congressional Record, 1990; Hoachlander, 1991;

National Assessment of Vocational Education, 1989). In addition, Tech-Prep programs are in various stages of development and data and materials are needed to address Tech-Prep program improvement and evaluation (Dornsife, 1991; Dutton, 1991; Hammons, 1991a).

2. Vocational education has major challenges in the areas of assessment, evaluation, and comparison of its programs, such as Tech-Prep. These challenges exist in part due to the inability to develop a consensus regarding performance indicators which could provide these data (Center for Vocational Education, 1979; National Assessment of Vocational Education, 1989; National Center on Education and the Economy, 1990).

Statement of the Problem

Little information is available which specifically applies to determining Tech-Prep program effectiveness and quality as determined by the surveyed directors/coordinators (Dornsife, 1991; Hammons, 1991a). Thus, it is difficult to make decisions through the comparison, assessment, and evaluation of Tech-Prep programs. This research was conducted to determine whether program performance indicators existed which Tech-Prep directors/coordinators deem necessary in determining their programs' quality, effectiveness, and goal attainment. If that proved to be the case, it would be necessary to discover whether there was

consensus among the directors/coordinators on which to utilize, and whether there was a pattern of preference for certain performance indicators when grouped into evaluation focus components.

Research Questions

Specifically, the study attempted to answer the following questions:

1. What are the Tech-Prep program performance indicators which Tech-Prep program directors/coordinators deem necessary to determine program quality, effectiveness, and goal attainment?

2. To what extent do Tech-Prep directors/coordinators agree on selected performance indicators which can be used as a basis for program comparison and/or evaluation?

3. Which performance indicators when grouped into focus components, are perceived as important by Tech-Prep directors/coordinators?

Research Procedures

In order to answer the research questions, a survey of identified Tech-Prep program directors/coordinators from the American Vocational Association's Region II encompassing the Southeastern United States and Puerto Rico Southern was conducted.

A questionnaire was developed by the researcher to collect the data necessary in order to answer the research questions. A panel of

experts, having extensive experience in the vocational program evaluation, examined the questionnaire to determine if any additional explanations, questions, performance indicators, or focus component clarifications were warranted. In addition, the expert panel examined the questionnaire for any ambiguities among any of the listed performance indicators which did not contribute to the purpose of the questionnaire. A pre-review of the questionnaire was given to a select group of faculty members and graduate students who scoured the questionnaire, looking for editorial errors and checking to ensure that the format was appropriate. Subsequent revisions were made as deemed necessary.

Packets containing a cover letter, a questionnaire, and a stamped envelope with a return address were mailed to each of the identified Tech-Prep program directors/coordinators in this study. Exactly one week after the initial packet mailing, a postcard was mailed, reminding the participants of the importance of their responding to this study. After three weeks, a second cover letter and replacement questionnaire, as well as another stamped envelope with a return address were mailed to each of the non-respondents. Sixty-seven program directors/coordinators were asked to participate, and 85 percent responded to the survey.

Data Analysis

All responses were coded and entered into a computer with the

Number Cruncher Statistical System (NCSS) software, which was utilized for a majority of the data analysis. Descriptive statistics and appropriate measures of central tendency were employed to examine the data. Tables and graphs were developed to assist in describing aspects of the study.

Findings

Research question 1. Agreement exists on which program performance indicators should be used in determining program quality, effectiveness, and goal attainment among Tech-Prep directors/coordinators. This agreement has a range of mean scores from 43.9 to 100 percent. The data indicate a level of agreement of 50 percent or greater on fifty-eight of the sixty selected program performance indicators. After considering the questionnaire non-response rate of 15 percent, forty-eight of the sixty indicators had a level of agreement of 50 percent or greater.

Research question 2. An examination of the data to determine the extent of agreement on performance indicators among Tech-Prep directors/coordinators consists of an analysis from three perspectives. First, the data are examined at "face value," or consensual agreement as reported by the respondents. Next, the data are examined considering the calculated standard error of the mean (SE). Lastly, the data are

examined using a conservative strategy which subtracts the non-response rate of 15 percentage points and two standard errors of the mean from the raw mean scores.

Initially, when examining the consensual values in both sum of the "Yes" responses and mean scores, fifty-eight of sixty performance indicators have calculated mean scores of 50 percent or greater. The data represent a 96.7 percent agreement rate among Tech-Prep program directors/coordinators.

Afterwards, the data are examined to insure a 95 percent confidence level at the lower boundary, forty-nine of sixty performance indicators have an adjusted mean score of 50 percent or greater. The agreement rate on performance indicators using this analysis is 81.7 percent.

Finally, the data are calculated using the conservative strategy, forty of sixty performance indicators have adjusted mean scores of 50 percent or greater. The data represents a minimum agreement rate on performance indicators of 66.7 percent.

Research question 3. The data were analyzed to determine which performance indicators, when grouped into focus components, are perceived as important by Tech-Prep directors/coordinators. The STUDENTS focus component has the most extreme range of mean values,

and the highest mean scores per group of performance indicators, having 60 percent of the indicators in the highest quartile of all indicators. The FACILITATORS focus component has the smallest range of mean values in the group, and had the largest representation in the next highest quartile. The CAREERS, PROFESSIONAL DEVELOPMENT and, ATTITUDES/PERCEPTIONS are equally represented throughout the four quartiles. The RESOURCES component has the lowest mean values of the six focus components with 70 percent of these indicators appearing in the lowest quartile.

Conclusions

The findings of this study support the following conclusions:

The data statistically suggests that the responding Tech-Prep directors/coordinators are in agreement as to which program performance indicators should be used to determine the quality, effectiveness, and goal attainment of their programs. These findings go against the existing literature which suggest a lack of consensus within vocational education on which performance indicators to utilize. (National Assessment of Vocational Education, 1989; Wasdyke, 1978).

This statistical agreement holds true even after the data were analyzed from three perspectives: the consensual agreement, the

consideration of the questionnaire's non-response rate, and the data analysis which insured a 95 percent confidence interval of the standard error of the mean. These data support the conclusion that performance indicators, upon which there is agreement, are available for comparison and evaluation of Tech-Prep program among this population. These data fill the void in the literature that addresses generally applicable performance indicators which can be used in the evaluation and assessment of vocational programs, such as Tech-Prep (Dornsife, 1991; Hammons, 1991a; National Assessment of Vocational Education, 1989; National Center on Education and the Economy, 1990; Wasdyke, 1978). History has proven that determination of quality indicators by policy-makers is ineffective, (National Assessment of Vocational Education, 1989; Wasdyke, 1978), and that the data collected support the notion that Tech-Prep directors/coordinators ("stakeholders") are willing to commit to the educational accountability movement which hold the staff accountable for both student and program performance (National Center on Education and the Economy, 1990). The data collected may represent a "first step" towards successfully evaluating vocational programs such as Tech-Prep.

The data support the conclusion that the STUDENTS focus component is perceived as the most important by Tech-Prep directors/coordinators. A void in the literature regarding the assessment

of the achievement of non-baccalaureate degree students, such as those students found in Tech-Prep programs, has now been filled (National Center on Education and the Economy, 1990). The data suggest that the CAREERS, PROFESSIONAL DEVELOPMENT, ATTITUDE/PERCEPTIONS, and FACILITATORS focus components are perceived as equally important because of the balance within each of the four quartiles. The data do not cause any of these focus components to significantly stand out among those selected. Seventy percent of the RESOURCES indicators (seven of the ten) fall in the lowest quartile of performance indicators' mean scores. The specifics regarding which focus components to use within vocational evaluation vary depending upon many factors (Wentling, 1975), but the data suggest that the Tech-Prep directors/coordinators surveyed perceive the RESOURCES focus component as the least important in determining program quality, effectiveness, and goal attainment.

Discussion

Prior to making any recommendations, some discussion is warranted concerning the researcher's intention in conducting this study and to share a couple of written comments expressed by participating Tech-Prep directors/coordinators.

The study was designed as a primary investigation to determine whether agreement existed among Tech-Prep program directors/coordinators on selected performance indicators which could be used in determining their programs' quality, effectiveness, and goal attainment. In addition, the study sought to provide insight regarding the extent of agreement among directors/coordinators on these indicators and which evaluation focus components were perceived most important. The data collected should provide valuable information to those individuals interested in Tech-Prep program evaluation, comparison, or assessment. However, it was not the intent of this study to imply that the identified program performance indicators and/or focus components selected for this research are the only suitable indicators for determining Tech-Prep program quality, effectiveness, and goal attainment. It was the intent of the study to determine whether the data collected provide enough supportive evidence to warrant further research.

Two Tech-Prep directors/coordinators expressed their beliefs about the Tech-Prep initiative by writing their comments on the return questionnaire. These comments are included below, on a purely non-judgmental basis, to insure that they are not lost forever in a stack of analyzed questionnaires. Both comments are repeated verbatim.

The first comment:

> I think it is a mistake to use Tech-Prep as a vehicle to push "at-risk" students, or any other students through the secondary school system. Students who lack good basic reading and computation skills are not going to succeed in a high tech work environment. In my opinion, there should be requirements (in terms of English and math skills) which students should be required to meet before they are admitted to any vocational curriculum and these requirements should not be "dumbed-down" for vocational track or Tech-Prep students.

The second comment:

> I believe strongly that Tech-Prep will greatly strengthen the American educational system and provide career opportunities for many who would ordinarily not be successful. We must work together to articulate - communicate - educate our youth for the future of our nation.

Recommendations

To date, this study is the first research focused on Tech-Prep program evaluation. The research was successful in identifying performance indicators and focus components that Tech-Prep directors/coordinators could use to determine quality, effectiveness, and goal attainment of their programs.

It is recommended that additional research be conducted:

- to replicate this study on other samples of the population to determine whether or not this sample, American Vocational Association

Region II - the Southeastern United States and Puerto Rico, was unique;

- to duplicate the study after three years to determine if the surveyed respondents' perceptions are identical to the data reported in this research;
- to determine whether the identified performance indicators and focus components can be adopted universally among all Tech-Prep programs;
- to determine whether the identified performance indicators and focus components can be adopted universally within vocational programs other than Tech-Prep;
- to take the findings of this research and transfer the performance indicators and focus components into an appropriate evaluation model to determine the practicality of that model in evaluating quality, effectiveness, and goal-attainment of Tech-Prep programs (However, caution is recommended so that performance indicators and focus components are not taken at face value. Other factors must be considered when developing such an evaluation model which influence both the program to be evaluated and the model to be used. Factors such as geographic location, levels of monetary support, types of students enrolled, and stage of development of the program are but a few of the factors that must be examined.);

- to develop a Tech-Prep evaluation model which concentrates on the STUDENTS focus component which was identified in this research as the most important by the surveyed directors/coordinators;
- to examine the feasibility of adding focus components and/or performance indicators, such as those suggested by the respondents to this study, which could be used to determine quality, effectiveness, and goal attainment of Tech-Prep programs.

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APPENDICES

APPENDIX A: QUESTIONNAIRE

VIRGINIA TECH

Division of Vocational and
Technical Education
Blacksburg, VA 24061-0254

TECH-PREP:
PROGRAM PERFORMANCE INDICATORS
A RESEARCH STUDY

This research study seeks input from Tech-Prep program directors/coordinators in identifying: Tech-Prep: Program Performance Indicators. There are two major areas of focus in this research. The first is to gather general information about existing Tech-Prep programs. The second is to learn which program performance indicators, as determined by program directors/ coordinators, are best suited to determine the quality, effectiveness, and goal attainment of Tech-Prep programs.

This questionnaire contains two parts. Part I solicits general Tech-Prep program information. Part II contains a selection of performance indicators arranged in checklist format. Part II also contains a section requesting input of additional performance indicators which might not have been included in the original checklist. Definitions of performance indicators, Tech-Prep programs, and other terms are provided to assist you in responding to the items.

Thank you for your participation.

DEFINITIONS:

The following definitions are provided to assist you in responding to this questionnaire.

Articulation Agreement: A commitment between institutions to a program designed to provide students with a non-duplicative sequence of educational achievements leading to competencies.

Performance Indicators: A series of indexes used to comprehensively measure the quality, effectiveness, and goal attainment of an educational program.

Tech-Prep program director/coordinator: An individual responsible for the coordination of all activities within the Tech-Prep program, provides logistical and support services as needed, and prepares program reports.

Tech-Prep programs: An articulated educational program of 2 years high school and 2 years post-secondary preparation which includes a common core of math, science, communications, and technologies designed to lead to an associate degree or certificate in a specific career field.

PART I: General Program Information

This section seeks general information about you and your Tech-Prep program. Please check only one response for each question.

1. How long have you been a Tech-Prep director/ coordinator?

- ☐ Less than one year
- ☐ between one and two years
- ☐ between two and three years
- ☐ more than three years

2. **Your position as Tech-Prep director/coordinator is:**

   ☐ a part-time position.
   ☐ a full-time position.

3. **Your immediate supervisor works in:**

   ☐ a secondary school setting.
   ☐ a post-secondary school setting.
   ☐ both secondary and post-secondary.

4. **Which category best describes your professional education background?**

   ☐ academic
   ☐ vocational

5. **What stage of development best describes your Tech-Prep program?**

   ☐ Planning Stage (establishing committees/consortium members)
   ☐ Developmental Stage (writing curriculum/producing marketing tools)
   ☐ Implementation Stage (curriculum written/active student recruitment)
   ☐ Advanced Stage (students enrolled/graduating from program)

Please check either YES or NO for questions 6 through 18.

To date, does your program or consortium:

6. **have a written and signed Tech-Prep program articulation agreement(s)?** YES ☐ NO ☐

7. **provide for in-service training for Tech-Prep teachers and joint consortium participants?** YES ☐ NO ☐

8. **consist of an articulated educational program of 2 years high school and 2 years post-secondary preparation which includes a common core of math, science, communications, and technologies designed to lead to an associate degree or certificate in a specific career field?** YES ☐ NO ☐

9. **provide for equal access to all students?** YES ☐ NO ☐

10. **provide preparatory services for all participants?** YES ☐ NO ☐

11. **provide for training of counselors in the areas of recruitment, placement, and student retention?** YES ☐ NO ☐

12. **work within the framework of a 3-year developmental plan?** YES ☐ NO ☐

13. **have an effective employment placement activity?** YES ☐ NO ☐

14. **transfer students to 4-year baccalaureate degree programs?** YES ☐ NO ☐

15. **consult with business/industry and labor unions?** YES ☐ NO ☐

16. **address the issues of drop-out prevention and the needs of minority youths, at-risk students, and females in non-traditional roles?** YES ☐ NO ☐

17. **have the computer capability to track Tech-Prep students in secondary through post-secondary training?** YES ☐ NO ☐

18. **have an established evaluation plan that provides data used to indicate program quality, effectiveness, and goal attainment?** YES ☐ NO ☐

19. **Program Performance Indicator data should be used to evaluate\compare: (check the one comparison most applicable):**

- ☐ Tech-Prep students with all non Tech-Prep students.
- ☐ Tech-Prep students only.
- ☐ Tech-Prep students with College Prep students.
- ☐ Tech-Prep students with General Education students.
- ☐ Tech-Prep students with Vocational Program students.

PART II: Program Performance Indicators

This section asks your opinion about Tech-Prep Program performance indicators.

Which of the following performance indicators would you use to determine the quality, effectiveness and goal attainment of your Tech-Prep program? (Please check either YES or NO for each performance indicator.)

20. School daily attendance rates ..... YES ☐ NO ☐
21. Student retention in the Tech-Prep program ..... YES ☐ NO ☐
22. Student academic progress on grade level ..... YES ☐ NO ☐
23. Student Tech-Prep program completion rate ..... YES ☐ NO ☐
24. Tech-Prep student program progression rate ..... YES ☐ NO ☐
25. High school graduation rate ..... YES ☐ NO ☐
26. Percent of gifted/talented students in Tech-Prep ..... YES ☐ NO ☐
27. Percent of at-risk and/or minority students in Tech-Prep ..... YES ☐ NO ☐
28. Number of students planning to continue their education beyond high school ..... YES ☐ NO ☐
29. Actual numbers of Tech-Prep transfers from high school to post-secondary ..... YES ☐ NO ☐
30. Students adequately prepared for entry into Tech-Prep program ..... YES ☐ NO ☐
31. Number of mentors available to Tech-Prep students ..... YES ☐ NO ☐

32. Number of Tech-Prep programs offered/ available to students ..... YES ☐ NO ☐
33. Number of apprenticeship programs linked to Tech-Prep ..... YES ☐ NO ☐
34. Number of cooperative education programs linked to Tech-Prep ..... YES ☐ NO ☐
35. Teacher/student ratio in Tech-Prep related courses ..... YES ☐ NO ☐
36. Per pupil expenditures for Tech-Prep program ..... YES ☐ NO ☐
37. Financial support provided from business/ industry/labor community ..... YES ☐ NO ☐
38. Number of Tech-Prep programs linking post-secondary to 4-year colleges/universities ..... YES ☐ NO ☐
39. Student access and quality of equipment, facilities, and instructional materials (e.g. labs, library, textbooks, computers) ..... YES ☐ NO ☐
40. Job placement rate ..... YES ☐ NO ☐
41. Time to employment (from graduation to on-the-job) ..... YES ☐ NO ☐
42. Rate of employment related to Tech-Prep job preparation ..... YES ☐ NO ☐
43. Entry employment levels ..... YES ☐ NO ☐
44. Rate of job promotion ..... YES ☐ NO ☐
45. Duration of employment ..... YES ☐ NO ☐
46. Job earning (salary) levels ..... YES ☐ NO ☐
47. Employer satisfaction with Tech-Prep graduates job skills ..... YES ☐ NO ☐
48. Student attainment of inter-personal skills ..... YES ☐ NO ☐
49. Student attainment of specific technical skills ..... YES ☐ NO ☐
50. Applied academics courses successfully completed ..... YES ☐ NO ☐
51. Student portfolios containing projects, writing samples ..... YES ☐ NO ☐
52. Tech-Prep student academic achievement rate at grade level ..... YES ☐ NO ☐
53. Student Tech-Prep job certification rate ..... YES ☐ NO ☐
54. Student demonstration of job competencies ..... YES ☐ NO ☐

55. Number of Tech-Prep courses attempted/ completed ..... YES ☐ NO ☐
56. Basic skills test scores ..... YES ☐ NO ☐
57. Advanced skills test scores ..... YES ☐ NO ☐
58. Standardized Achievement Test scores (e.g. SAT, ACT) ..... YES ☐ NO ☐
59. Overall student grade point average or class ranking ..... YES ☐ NO ☐
60. Amount of publicity/media attention ..... YES ☐ NO ☐
61. Rate of positive program recognition among students ..... YES ☐ NO ☐
62. Rate of positive program recognition among facilitators (teachers, guidance) ..... YES ☐ NO ☐
63. Extent to which students' and facilitators' suggestions are incorporated into program ..... YES ☐ NO ☐
64. Business/industry reactions to the overall program ..... YES ☐ NO ☐
65. Recognition programs for achievements of students and facilitators ..... YES ☐ NO ☐
66. Motivation and perceptions of Tech-Prep students ..... YES ☐ NO ☐
67. Level of student satisfaction toward academic achievement ..... YES ☐ NO ☐
68. Evaluation of the program by Tech-Prep students and alumni ..... YES ☐ NO ☐
69. Number and frequency of program evaluations ..... YES ☐ NO ☐
70. Tech-Prep program recruitment activities (e.g. targeting special groups) ..... YES ☐ NO ☐
71. Career counseling services ..... YES ☐ NO ☐
72. Student placement services ..... YES ☐ NO ☐
73. Follow-up services ..... YES ☐ NO ☐
74. Individualized learning programs (recognizing differences in aptitudes, learning speeds, styles and backgrounds) ..... YES ☐ NO ☐
75. Numbers of at-risk students (e.g. minority, handicapped, disadvantaged, single parent homes, criminal offenders) ..... YES ☐ NO ☐
76. Teacher preparation, qualifications, and certification ..... YES ☐ NO ☐

77. Professional in-service development of staff ..... YES ☐ NO ☐

78. Rates of Tech-Prep program participation (e.g. parents, business community, industrial employers, policy-makers) ..... YES ☐ NO ☐

79. Vocational guidance program services offered ..... YES ☐ NO ☐

80. Please add any Program Performance Indicators which you feel should be included and were not mentioned in those provided in the checklist.

Thank you for your assistance. Please place the completed questionnaire in the stamped, pre-addressed envelope provided. If possible data collection for this project will conclude on February 29, 1992.

Frank T. Hammons
Research Director
225 War Memorial Hall
Virginia Tech University
Blacksburg, Virginia 24061-0335

APPENDIX B: INITIAL COVER LETTER

VIRGINIA TECH

Division of Vocational &
Technical Education

College of Education
Blacksburg, Virginia 24061-0254

January 24, 1992

Name
Title
Institution
Street Address
City, State Zip Code

Dear Mr./Ms. Name:

Tech-Prep programs have recently received Congressional support with the passing of the new Carl D. Perkins legislation. The guidelines for funding are intended to encourage the growth and development of the Tech-Prep concept. This funding could greatly affect the quality of the vocational programs as they exist. However, no one really knows what types of performance indicators to use to determine the quality, effectiveness, and goal attainment of Tech-Prep programs.

Your Tech-Prep program is one of a small number in which program directors/coordinators are being asked to give their opinion on these matters. Your region was drawn in a random sample. In order that the results will truly represent the thinking of the directors/coordinators of Tech-Prep programs, it is important that each questionnaire be completed and returned. In addition, we would like the questionnaire for your program to be completed by the program director/coordinator. If none exists, then it should be completed by the individual who has the overall management responsibility of the Tech-Prep program.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off the mailing list when your questionnaire is returned. Your name will never be placed on the questionnaire.

The results of this research will be made available to officials and representatives in state government, members of Congress, and all interested citizens. In addition, a 2+2+2 honorarium ($222.00) will be randomly awarded to one of the respondents returning the completed questionnaire. Those respondents returning the completed questionnaire within two weeks of mailing will be afforded twice the probability to receive the honorarium as those who take longer.

I would be most happy to answer any questions that you might have. Please write or call. The telephone number is (703) 231-5467. Thank you for your assistance.

Sincerely,

Frank T. Hammons
Project Director

Enclosures

Virginia Polytechnic Institute and State University

APPENDIX C: POSTCARD REMINDER

February 1, 1992

Last week a questionnaire seeking your opinion about Tech-Prep Program Performance Indicators was mailed to you. If you have already completed and returned it to us please accept our sincere thanks. If not, please do so today.

Because the questionnaire is only being sent to a small, but representative, sample of Tech-Prep program directors/ coordinators, it is extremely important that your response be included in the study if the results are to accurately represent the opinions of your group.

If by some chance you did not receive the questionnaire, or if it was misplaced, please call me right now, collect (703-231-5467), and I will send another one to you immediately.

Sincerely,

Frank T. Hammons, Research Director

Frank T. Hammons
Research Director
225 War Memorial Hall
Virginia Tech University
Blacksburg, VA 24061-0335

Name
Title
Institution
Street Address
City, State Zip Code

APPENDIX D: SECOND FOLLOW-UP LETTER

VIRGINIA TECH

Division of Vocational &
Technical Education

College of Education
Blacksburg, Virginia 24061-0254

February 15, 1992

Name
Title
Institution
Street Address
City, State Zip Code

Dear Mr./Ms. Name:

About three weeks ago I wrote to you seeking your opinion on the kinds of Tech-Prep performance indicators you would like for your program. As of today I have not yet received your completed questionnaire.

This research was undertaken because of my belief that the opinions of Tech-Prep directors/coordinators regarding appropriate performance indicators are essential to the determination of program quality, effectiveness, and goal attainment. It is my assertion that your opinions must be taken into account in the formation of policies and evaluation models for programs in which you have a vested interest.

I am writing to you again because of the significance each questionnaire has to the usefulness of this study. Your name was drawn through a scientific sampling process in which every Tech-Prep program director/coordinator had an equal chance of being selected. In order for the results of this study to be truly representative of the opinions of all Tech-Prep directors/coordinators it is essential that each person in the sample return their questionnaire. As mentioned in my last letter, the questionnaire should be completed by a Tech-Prep program director/coordinator.

In the event that your questionnaire has been misplaced, a replacement is enclosed.

Your cooperation is greatly appreciated.

Cordially,

Frank T. Hammons
Project Director

P.S. A number of people have written to ask when the results will be available. I hope to have them out sometime next month.

VITA

Frank Tipton Hammons, Jr. was born in Pineville, Kentucky, on August 1, 1946, to the parents of Frank T. Hammons, Sr. and Joan Louise Hill Hammons. His first eighteen years were spent with his parents in the Counties of Bell, Harlan, Knox, and Whitley in southeastern Kentucky.

He graduated from Corbin High School in Corbin, Kentucky, in 1964, and in the Fall of that year enrolled in Eastern Kentucky State Teachers College, which is currently known as Eastern Kentucky University. After a year and one-half, he enlisted in the United States Air Force and was assigned to the Civil Engineering Squadron at Offutt, Air Force Base, Nebraska. While serving in the Air Force he received various awards, gained a technical education and acquired specialized training. After twenty years of honorable service in the Air Force, he retired as a Master Electronics Instructor and Non-commissioned Officer in charge of the Tactical Radar Training Section, McClellan Air Force Base, California. Upon his retirement, he held a post-secondary teaching certificate in California where he had served as an adjunct faculty member at a number of institutions, teaching in a variety of electronic

technology programs.

In 1987, immediately after his retirement from the Air Force, he enrolled in the Northern Virginia Community College in Alexandria, Virginia, where he received his Associate in Science Degree in May of that same year. In the Fall, he enrolled at George Mason University in Fairfax, Virginia, pursuing a Baccalaureate in Science Degree in Education. During this same time period, he was employed full-time teaching electronics in an adult post-secondary program, and was an active member of the Board of Advisors for the Vocational Education program in the Arlington County, Virginia, School District. He graduated from George Mason University in May of 1989, with honors.

In the Fall of 1989, he was awarded a teaching assistantship in the Division of Vocational Technical Education at Virginia Polytechnic Institute and State University in Blacksburg, Virginia. During this time period, he taught undergraduate teacher certification courses in the Trade and Industrial Area, performed research, evaluated Tech-Prep programs, served as a consultant in various educational environments, and was an adjunct faculty member teaching robotics at a local community college. He was an elected delegate to the Graduate Student Assembly at the University, and served as student representative during the development

of the Division's Five-Year Plan. He received his Masters Degree in Vocational Technical Education in August of 1990.

He applied and was accepted into the Vocational Technical Education Doctoral Studies program in the Fall of 1990 at Virginia Polytechnic Institute and State University, and was again awarded a teaching assistantship. In the Fall of 1991, he was awarded a graduate research associate's position in the Assistant Dean's Office in the College of Education. From 1990-92, he was involved in various higher education activities, such as, National Association for the Accreditation of Teacher Education (NAATE) program re-certification; funds development; and conceptualization, development, and coordination of statewide, regional, and local conferences.

He completed his course work and received his Doctorate in the Spring of 1992. Frank holds membership in the American Vocational Association, Epsilon Phi Tau, Golden Key National Honor Society, National Association of Trade and Industrial Educators, Omicron Tau Theta, Phi Delta Kappa, and Virginia Association of Vocational Education.

Frank Tipton Hammons Jr.