# COST-BENEFIT ANALYSIS OF SECONDARY VOCATIONAL EDUCATION PROGRAMS

by

K. K. Navaratnam

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APPROVED:

John H. Hillison, Chairman

F. Marion Asche

James F. Johnson

Stephen R. Parson

William T. Price, Jr.

J. Dale Oliver

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ABSTRACT

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The purpose of this study was to propose and field test a cost-benefit analysis model to determine the profitability of secondary vocational education programs. The model consisted of costs, process, and benefits components. Instructional personnel, building, equipment, materials and supplies, administration, travel, services, utilities, and maintenance were the major components of the costs. Process implied the actual conduct of the program. Increased earnings from graduates' employment, earnings from cooperative placement, provision of services, and noneconomic benefits obtained by the graduates were the components of the benefits.

Costs and benefits data for field testing the model were obtained from four programs from the four vocational service areas of trade and industrial, occupational home economics, business education, and marketing and distributive education selected from both a comprehensive high school and an area

vocational education center in the Roanoke County School Division, Virginia. All graduates of 1983/84 of the four programs were surveyed to gather data on them. A 73.9% return was obtained from the survey. The difference between the graduates' current earnings and earnings determined by using the Federal minimum wage for the same number of work hours by employed graduates was considered as an income benefit.

Actual differences between discounted benefits and the gross costs were used to determine the profitability of programs. The following conclusions were drawn from the findings of this study:

1. The trade and industrial, business education, and marketing and distributive education programs were economically profitable.
2. The occupational home economics program was not economically profitable.
3. Graduates in each program have obtained several noneconomic benefits.
4. The proposed cost-benefit analysis model was determined useable and transportable to other vocational education settings.

Based on the findings and conclusions of this study, the following recommendations were drawn:

1. That local vocational administrative units use the concept of cost-benefit analysis as an evaluation technique for secondary vocational education programs.
2. That a research study be conducted to determine what other costs and benefits should be considered in the model.
3. That a research study be conducted to determine the economic value of noneconomic benefits.
4. That a longitudinal cost-benefit analysis is needed to determine economic earning and type of jobs held by graduates after graduation.
5. That a study be conducted using cost-benefit analysis with an appropriate comparison group to vocational graduates.
6. That an annual cost-benefit analysis of vocational programs be conducted for each school system to make comparative judgement of their programs.
7. That post-secondary vocational programs explore the possibility of using cost-benefit analysis for evaluating programs.

## DEDICATION

All those Tamils killed and wounded,
including my brothers-in-law, relatives,
and close friends as result of continuing
racial and cultural genocide of the
Sri Lankan armies.
My parents, sisters, brothers-in-law,
nephews, and nieces.
My wife, and son, .
For God-my Lord.
Finally for my self-determination.

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this time without my degree as a result of "excesses" of the Sri Lankan armies.

Dr. James Clouse was on my committee until the last month. Because of an international assignment he was not able to continue to serve. However, I am thankful for his power of understandability of international students and specifically for his guidance and counseling geared to my stateless situation.

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# CHAPTER 1

## INTRODUCTION

Vocational education was established as a Federally supported educational program by passage of the Smith-Hughes Act of 1917. Under the influence of the Vocational Education Act of 1963 and subsequent amendments, vocational education has grown rapidly while accommodating social, technical, political, and economic changes. At present, vocational education has become a focal point for legislators, educators, parents, taxpayers, students, and others in the total process of public education (Golladay & Wulfsberg, 1981). The vocational education process is inexorably linked to the work required by society. Work is a necessary condition for people to live satisfactorily.

The definition given by the Congress of the United States to vocational education determines to a large extent the ways in which vocational education influences the work, social, cultural, civil, and personal relationships among its clientele. The Congressional definition is as follows:

> Vocational education means organized educational programs which are directly related to the preparation of individuals in paid or unpaid employment in such fields as agriculture, business occupations, home economics, health occupations, marketing and distributive occupations, technical and emerging occupations, modern industrial and

> agriculture arts, and trade and industrial occupations, or for additional preparation for a career in such fields, and in other occupations, requiring other than a baccalaureate or advanced degree and vocational student organization activities as an integral part of the program. (United States Congress, 1984, p.55)

The new vocational education act, the Carl D. Perkins Vocational Education Act, encourages state and local governments to expand, improve, modernize, and develop high quality vocational education programs by expanding their roles. Accordingly, state and local governments have to be more efficient and responsive in terms of costs and benefits. That is, the government which is responsible for raising and spending public funds must be accountable to its public in a practical and meaningful manner.

## Vocational Education Administration

Vocational education is organized and administered to ensure the provision of fundamental education to develop the necessary skills for employment opportunities in society. The Vocational Education Act of 1963 brought major changes in the organization and administration of vocational education. The Federal level of vocational education became a part of the United States Office of Education in 1964. Currently it is part of the United States Department of Education. Accordingly, Federal, state, and local governments have shared financial and administrative commitments to vocational education. Federal dollars for

vocational education are administered through state boards for vocational education. Categorical funds for expenditures such as state advisory councils, basic grants, program improvement and supportive services, special programs for the disadvantaged, and consumer and home making education are specified in the Federal Vocational Act (Golladay & Wulfsberg, 1981). The Federal government mandates spending requirements by state and local governments. These requirements include the matching of a portion of Federal dollars (United States Congress, 1984). In fiscal year 1979, the total expenditure for vocational education was $6,149,929,000 in which the Federal share was $607,971,000 and state and local share was $5,541,959,000 (Golladay & Wulfsberg, 1981). Accordingly, state and local governments have spent approximately nine dollars for every dollar spent by the Federal government in vocational education. This reveals that under the new Federal role in vocational education, state and local governments have to raise and spend more dollars in vocational education than the past. Evidently, fiscal accountability is expected to increase as state and local governments take greater responsibilities for raising their own revenues (Fox & Quindry, 1984).

The Federal government coordinates efforts with state boards of education or with separate state boards for vocational education which are organized by each state to

serve as the responsible administrative agency for vocational education. Each state is responsible for the organization of its vocational education programs. Thus, there are variations in the organizational structure and administration of vocational education among the 50 states in the United States (Gilli, 1976). In many cases, a division of vocational education within the state department of education is responsible for all vocational education in a state. The director of vocational education for the state is usually administratively responsible to the state superintendent directly or indirectly through an assistant state superintendent. All states are required to form an advisory council on vocational education. The state advisory council ensures that the vocational education program is planned and implemented. That is, the advisory council performs consultative services to the division of vocational education of the state department of education in helping it to undertake and administer vocational education (Evans & Herr, 1978). The organization and administration of vocational education varies not only from one state to another, but within states as well. A school board is responsible for administering the local vocational education program.

## Vocational Education Enrollment

Between 1978 and 1979, there were 28,000 secondary and postsecondary schools offering vocational education in the United States; of that total, over 16,000 were at the secondary level. Approximately 20 million students were enrolled in vocational education, almost two-thirds of which were in secondary vocational education (Golladay & Wulfsberg, 1981). Vocational education consists of nine major program areas (Evans & Herr, 1978). The areas used to categorize vocational program offerings are:

1. Agriculture,
2. Marketing and Distribution,
3. Health,
4. Consumer and Home Making,
5. Occupational Home Economics,
6. Industrial Arts,
7. Office Occupation,
8. Technical, and
9. Trade and Industrial.

Table 1 shows student enrollment in vocational education program by service areas.

Table 1
Enrollment in Vocational Education by Service Areas: 1978-79

| Program area | Total enrollment |
|---|---|
| Agriculture | 964,452 |
| Distribution | 927,929 |
| Health | 791,155 |
| Consumer and home making | 3,658,475 |
| Occupational home economics | 577,818 |
| Industrial arts | 1,681,927 |
| Office occupations | 3,439,623 |
| Technical | 472,200 |
| Trade and industrial | 3,411,796 |
| Other | 1,108,245 |
| Total | 17,033,620 |

Source: Golladay, M.A., & Wulfsberg, R.M.(1981)
Note. Updated data could not be obtained.

## Vocational Education Trends

Vocational education is closely tied to the demand for products and services in society. However, with the prospects of continued improvements in productivity and technological innovations, certain types of jobs will change or disappear and new jobs will be created mainly in manufacturing industries, recreation, amusement, computer services, and legal assistants (National Center for Educational Statistics, 1984). Based on the above prospects, there will be a multiplicity of new demands and challenges for vocational education in the near future. It has been predicted that "realization of new demands and challenges will require building a strong base of support for vocational education in local communities and in every state" (Bottoms, 1984, p.10). In fact, the magnitude of demands and challenges for vocational education has been enlarged with the new federalism of the 1980s. The challenges, demands, and stronger base of support for vocational education could be met through economic efficiency. Fox and Quindry (1984) have defined economic efficiency "as assigning each function to the level best suited to its administration and control, with financing based on where the benefits are received" (p.455). Economic efficiency can be studied through cost-benefit analysis.

## Vocational Education Accountability

An economic recession in the early 1980s and increasing Federal budget deficits have caused public and private agencies to justify the dollars they spend on educational programs (Carr, Castilhos, Davis, Snyder, & Stecher, 1982; Wylie, 1983). Federal support for education has begun to decline and the economic forecast for educational agencies towards the 21st century appears to be quite bleak (Milbergs, 1981). Many educational agencies are beginning to look for programs they can cut in an effort to reduce expenses and increase the effectiveness of resource utilization. Evidently, many vocational education programs in the United States are under a considerable amount of fiscal pressure as well as being in the midst of a period of heightened debate on educational policies and financing system (Feldman, 1981; Phelps, 1984). It should not be surprising that this debate is peppered with references to cost-effectiveness. Vocational education needs a strong and sound basis to justify its profitability to its critics and to all three levels of government.

In the light of the above concerns, vocational education has to demonstrate its profitability from the point of view of both school and society. This demonstration of profitability has to be done quickly, precisely, and clearly. Local school boards are interested to see the economic impact of vocational education in their communities

as soon as possible rather than descriptive reporting of inputs, staff activities, and participants' information (Howell & Frankel, 1983). For this purpose, evaluation of vocational education should be viewed from a point of cost-benefit analysis. The concept of cost-benefit analysis must emphasize the following:

1. Assessing of inputs,
2. Determining and measuring program outputs, and
3. Using evaluation findings for program revisions, organizational renewal, and accountability to public, funding sources, and to the profession (Mayeske, 1982).

Based on the above perspectives, the administration of vocational education must examine the costs of attaining its programs in terms of benefits. That is, efficiency of vocational education must be examined in terms of costs and benefits of individual programs. Suchman (1967) has defined program efficiency as "the capacity of an individual, organization, faculty, operation, or activity to produce results in proportion to the effort expended" (p.9).

## Cost-Benefit Analysis

The procedure to be used in this study is cost-benefit analysis. Hartely (1968) defined cost-benefit analysis:

> as a means of assessing the worth of existing and proposed projects; it involves the enumeration and evaluation of all relevant costs and benefits over a period of time; ideally, benefit should exceed costs, or B/C>1; measurement criteria for the benefits should be specified. (p.253)

From this point of view, cost-benefit analysis may be a great value to vocational education administrators to appraise the outcomes of investments as well as some means of justification for seeking increased funds. Cost-benefit analysis focuses on the relationship of resources to results (McGivney, 1969). Therefore, vocational education administrators who must plead stronger cases for additional funds can use the cost-benefit tool to find out the profitability of their programs by comparing relative costs and benefits incurred in them. The comparison of relative costs and benefits is an excellent way to present evaluation information for the users and funders of vocational education programs.

## Background of Problem

Vocational education is a means through which occupational skills needed by learners are developed from the point of view of society as a whole. A major challenge confronting vocational education is to justify the quality of programs in terms of dollars and cents. It has been indicated that:

> the present need is clearly seen to be a measure of the quality of educational output; and it is this arena that the new trend toward 'accountability' for the taxpayer's dollars must be met if the educational system is to continue as we know it. (Duncan, 1971, p.27)

There is mounting criticism regarding the effectiveness of vocational education. The traditional method of evaluating

vocational education, that is, establishment of relationship between dollars and educational inputs, is an inadequate and incomplete measure of efficiency of vocational education (Warmbrod, 1977). Vocational education was an immediate target for the Federal budget cuts in January 1981. As a result of this, vocational education in many states is already under fiscal pressures (Hartle & Rosenfeld, 1984). Higher level of public awareness and support from the local community are needed to give momentum to vocational education. School revenues have been reduced with cuts in impact aid and emergency school assistance funds (Hartle & Rosenfeld, 1984). It is the school's responsibility to show society the profitability of vocational education through a clear, precise, and timely evaluation in order to help encourage public support in financial commitments.

There is widespread dissatisfaction among people over the performance and contribution of schools to local communities. It has been pointed out that vocational education has to meet new demands and expectations of local communities (Taylor, 1984). People may prefer to see the actual impacts of vocational education programs in local communities. In fact, there is no evidence available to show the impacts to the public in local communities where vocational programs are located. Discussion with Dr. Nevin Frantz (Personal communication, October 22, 1984), Director of the Division of Vocational Technical Education at

Virginia Polytechnic Institute and State University, revealed that evaluation of vocational education in the past failed to provide adequate, valid, and defensive results in addition to incorporating noneconomic outcomes and distribution of benefits as a whole. The most important part of the above argument is that accountability in vocational education has been primarily based on inputs, staff activities, and participation information. There is little evidence of distribution of those benefits in local communities where vocational programs are located.

The need to relate dollars and outputs is crystal clear and the public will no longer permit neglecting of output and its distribution in evaluation activities. Measures of the affective domain must be attempted together with the cognitive domain of vocational education. Historically, it has been assumed by vocational education personnel that the benefits of vocational programs have outweighed the costs (Fleischman, Hoptock, & Young, 1983). In fact this was the rationale for expectation of public support for vocational education in the past. But, unless and until vocational administrators show the relative costs and benefits, the evaluation results leave them little basis to plead for more dollars.

## Statement of Problem

Assessment of costs and benefits of secondary vocational programs and their reporting is crucial for strong community support, especially under the present secondary vocational education funding system. Previous evaluation of vocational education has been preoccupied with an identification and determination of inputs at the expense of outputs. A paucity of studies in cost-benefit analysis because of methodological and measurement problems of outcomes and measurement of noneconomic outcomes have become major concerns regarding the accountability of vocational education.

Unfortunately, few vocational administrators are familiar with the technique of cost-benefit analysis, and there are limited opportunities for practical guidance. While there are some cost-benefit studies of vocational education, generally they have been conducted by economists or with the help of economists (Bruce, 1967; Ghazalah, 1975; Warmbrod, 1977). Those studies were large scale in nature and generally conducted purely for policy making. None of the studies have been conducted only from school's point of view nor at a single program level within a service area. Those studies have seldom been used by vocational administrators to show the profitability of their programs at the local community level. A review of literature indicates there is an absence of a practical evaluation technique which

considers both costs and benefits. Therefore, it is clear there is a need for a practical cost-benefit analysis model to judge secondary vocational education at the local level.

The author believes that use of a practicable cost-benefit analysis is not beyond the abilities of the average vocational administrator who is provided clear guidance, and given examples of methods that address some of the basic dilemmas encountered when attempting to apply the cost-benefit analysis technique to vocational programs. Thus, the author determined to develop a cost-benefit analysis model to judge secondary vocational education in terms of inputs and outputs that uses both economic and noneconomic values.

Specifically, the objectives of this study were to:

1. Propose a cost-benefit analytical model to determine the profitability of secondary vocational education.
2. Field test the model to determine its useability.
3. Gather feedback information on transportability of the model based on the field testing.
4. Make recommendations on the use of the cost-benefit analysis model for secondary vocational education.

The research questions answered in this study were:

1. What are the specific components of the cost-benefit analysis model used to determine the profitability of secondary vocational education?
2. How effectively can costs and benefits of secondary vocational education be calculated?
3. How effective is the cost-benefit analysis model as an evaluation technique for secondary vocational education?

## Significance of the Study

The basic purpose of vocational education is to prepare people for work and to upgrade work skills. Students want entry level skills as quickly as possible to lead them directly into a job that pays a meaningful wage by the society and to build a foundation for the future (Steinberger, 1984). A slowdown in aid for vocational education under the new federalism became a threat to vocational education especially for the public schools (Fox & Quindry, 1984). That is, the public schools faced a shortage of funds to conduct vocational education programs. There is a trend toward greater scrutiny of school budgets and appropriation requests and of schools' performance by several significant groups. Legislative bodies have increased requirements for accountability and created a competitive situation for the limited number of dollars with other educational agencies. Based on the above

perspectives, it is important not only to measure inputs but also to measure outputs of vocational education programs.

At present, there is no standard procedure available to measure costs and benefits of vocational education at the local level. Since it is crucial to have a technique which facilitates comparison of costs and benefits, a newly developed cost-benefit model could be a milestone for credible accountability of vocational education.

The model must have the ability to quickly, accurately, and systematically provide accountability information to vocational administrators, funding sources, and local communities in general. Further, analyzing both economic and noneconomic benefits can be a very useful concept to convince local communities as a whole and plead for strong support for vocational education. Development and diffusion of human capital appear to be necessary to ensure sustained economic development (Mincer, 1984). Accordingly, the developed model could be used by vocational education administrators to show the local community the relative benefits of the program compared to its costs. Local communities can be extremely influential in the development of vocational education if they are convinced of its value. The developed cost-benefit analysis model could be useful for administrators to have an accountability and reporting system on simple economic analysis in vocational education. Development of a testable cost-benefit analysis model could

help administrators determine the profitability of investing in vocational training and skill development programs (Ghazalah & Pejovich, 1973). Further, the model could be used by policy makers to revise and improve the quality of vocational education. This model may be a start in the new direction of greater accountability and it could be an effective decision making tool in vocational education at the local level. Increases in the evaluation of vocational education activities through a cost-benefit analysis model will enhance the total vocational education program at the local level.

## Assumptions

1. All employees, whether vocational graduates or not, are able to earn the Federal minimum wage.
2. One hundred percent of the costs for the vocational program can be attributed to the senior class rather than being prorated and based upon years of enrollment in the program.
3. Lifespan of equipment can be determined by its cost and size. For example, expensive and large equipment can be considered to have a longer lifespan than smaller and less expensive equipment.

## Limitations

The purpose of this study was to develop and use a cost-benefit analysis model to judge secondary vocational education at the local level. The study was limited to a vocational education program in a comprehensive high school and an area vocational center in a specific Virginia school division. However, it may be of use to other vocational programs offered under different administrative and organizational settings. The model considers costs and benefits, both economic and noneconomic, to the extent they are amenable for subjective and objective estimation in terms of dollars and cents. Wherever necessary, assumptions have been made to simplify the calculations of costs and benefits.

## Summary of Chapter

Vocational education is a cooperative effort of Federal, state, and local government utilized in order to help meet the needs of the existing and future work force in the United States. The vocational education acts and their amendments have worked cooperatively with state and local governments to fund vocational education. Increased administrative responsibilities with increased student enrollment has created a demand for raising and spending more public dollars. Consequently, vocational administrators have become more responsive not only to raise

the dollars but also to justify those dollars in terms of benefits achieved through vocational education programs. Thus, an accountability system has become important to the people impacted by taxing and spending. A review of literature showed there is no standard analytical technique used by vocational administrators to relate costs and benefits to judge the profitability of vocational education programs to their public. Therefore, the purpose of this study was to propose and field test a cost-benefit analysis model to justify the profitability of vocational education programs. Considering the characteristics and limitations of cost-benefit analysis, it could be very useful in helping vocational administrators to justify their programs at the local level to the public.

# CHAPTER 2

## REVIEW OF LITERATURE

This chapter discusses the concepts involved in cost-benefit analysis and how they can be used for vocational education programs. A literature review revealed that cost-benefit analysis has thus far been primarily limited to programs which lend themselves to achieving economic output and programs which are closely associated with industry. However,a more general cost-benefit analysis would be more useful because of its flexibility in dealing with human intangible variables within a vocational education system. This chapter consists of two parts:

1. The first part presents a brief overview of concepts of cost-benefit analysis.
2. The second part reviews cost-benefit analysis in vocational education and the derived cost-benefit analysis model for this study.

## Concept of Cost-Benefit Analysis

Cost-benefit analysis is a monetary tool by which the cost of creating a result or product is compared with the value of the result or product that is created. Cost-benefit analysis has been viewed in many different perspectives by many experts, even some from noneconomic output oriented agencies in recent years. The following definitions reveal the basic ingredients and concepts of cost-benefit analysis:

> Cost-benefit analysis is a procedure by which the cost of alternative means of achieving a stated effectiveness, or conversely the effectiveness of alternative means for a given cost, are compared in a series of numerical indices. (Qayum, 1966, p.8)

> Cost-benefit is the relationship of the resources required(cost) to attain certain goals(benefit). It is based on the economic concept that many executive decisions involve the allocation(best use) of limited resources among competing requirements. The allocation of variables resources is determined by a comparative analysis of the current system with presumably practicable alternative system. (Abraham, 1966, p.1)

> Cost-benefit analysis is an analytical study designed to assist a decision maker in identifying preferred choice among possible alternatives. Usually it consists of an attempt to minimize dollar cost subject to some mission requirement (which may not be measurable in dollar terms) or, conversely, to maximize some physical measures of output subject to a budget constraint. (Edward, 1967, p.1)

> Benefit-cost analysis is a tool for systematically developing useful information about the desirable and undesirable effects of public sector programs or projects. (Anderson & Settle, 1977, p.11)

> Cost-benefit analysis attempts to view a program of action in light of costs and the return or outcomes also expected in dollars. (Wentling, 1974, p.24)

> Cost-benefit is an analysis of the cost and the resulting monetary benefits of one or more program or program components. (Forbes, 1974, p.21)

> Cost-benefit analysis is an evaluative technique that relates the total value of benefits of a program to the total costs of the program. (Warmbrod, 1977, p.143)

The concept of cost-benefit analysis is defined in different ways by different authors. However, as a matter of principle, it is evident that quantification of inputs and outputs is the basis for using cost-benefit analysis as an analytical tool to evaluate public programs. Rothenberg (1975) pointed out that cost-benefit analysis is most often used with distinctive strategies in the areas of water resource development projects, highway evaluation projects, urban renewal programs, educational programs, and model city projects. According to the above definitions, cost-benefit analysis consists of four interrelated categories:

1. Identification,
2. Classification,
3. Quantification, and
4. Presentation.

Similar categories have been adopted by many users of cost-benefit analysis (Carr et al., 1982; Irvin, 1980; Spencer, 1982; Wentling, 1974). When costs and benefits

have been identified, and valued, the evaluator is ready to determine profitability of the program.

Cost-benefit analysis can have a variety of meanings to different people. It allows the evaluator to determine whether or not a particular investment is worthwhile as well as how worthwhile one investment is relative to another. It can help evaluators focus on the questions of how an agency can allocate scarce resources so as to maximize social welfare. Or, put differently, cost-benefit analysis can be applied in welfare economics. Welfare economics is concerned with the formulation of criteria that will allow decision makers to distinguish between those activities, programs, or projects that would make society better off and those that would make it worse off (Anderson & Settle, 1977). That is, the fundamental issue of welfare economics is how to determine whether a society has been made better off or worse off. There are two types of analysis that are economic in nature, yet that differ from cost-benefit analysis and therefore merit some consideration at this point.

One of these types is impact analysis. Its purpose is to show the total social and economic effects of using resources. In vocational education it may mean the measurement of the relative benefits received by program participants (Mayeske, 1982). Impact studies are broader in scope than a cost-benefit analysis.

Another type, which is actually a subset of cost-benefit analysis, is called cost-effectiveness analysis. It is useful when it has been decided to achieve certain benefits and the only criterion is to obtain them at the lowest possible cost (Wentling,1980). Cost-effectiveness should not be confused with cost-benefit analysis. Wentling (1982) defines cost-effectiveness analysis as an:

> analytical study designed to assist a decision maker in identifying a preferred choice among possible alternatives and, in essence, is a comparison of alternative courses of action in terms of their costs and effectiveness in attaining specific goals or objectives. (p.5)

Carpenter and Haggart (1970) view cost-effectiveness analysis as a planning tool that assists the educational planner in relating the resources required by an educational program to determine its effectiveness. Levin (1975) puts emphasis on cost-effectiveness as "a strategy or a combination of strategies that maximize the results for any particular resource with budget constraints" (p.89). Thus, a cost-effectiveness analysis is appropriate if it has already been determined that a certain program of a certain size is worth conducting, and the only concern is to undertake the program as inexpensively as possible.

## Net Present Worth

The purpose of this section is to move from the theoretical basis to actual measurement of benefits and costs. The main purpose of a cost-benefit analysis is to determine whether the net value of results or outcomes produced rises or falls when a specific program is undertaken. Cost-benefit analysis involves identification and measurement of all gains and losses caused by a program. Once costs and benefits are known, they must be priced, and their dollar values determined. In program evaluation, the objectives of the evaluation provides the standard against which costs and benefits are defined. Gittinger (1982) defined a cost as "anything that reduces an objective, and a benefit is anything that contributes to the objective" (p.43). In almost all programs or project analysis, costs are relatively easier to identify than benefits. By definition, cost-benefit ratio can be represented with the following formula:

$$\text{Cost-benefit ratio} = \frac{\text{Total value of benefit(B)}}{\text{Total value of cost(C)}}$$

Measurement of cost-benefit ratio based on the above arithmetic calculation immediately confronts a problem. The

problem is that evaluator must find some way to evaluate programs that will last several years and that have differently shaped future cost and benefit streams. In general, this problem is addressed through discounting. As has been recognized through the folk wisdom of people through the ages, present values are better than the same values in the future, and earlier returns are better than later. This principle can be used to overcome the weakness of not discounting measures of program worth by including a time dimension in the above arithmetic calculation through the use of discounting. Gittinger (1982) noted that "discounting is essentially a technique by which one can reduce future benefits and costs streams to their present worth" (p.304). According to Gittinger, the discount factor is represented as follows:

$$\text{The Discount Factor} = \frac{1}{(1+i)^n}$$

where,

i= interest rate

n= time period in years

The above factor is used to calculate the present worth or value (Pv) of a future value (Fv) at the end of the nth period at the interest rate of i. Thus, the present value formula is:

$$Pv = Fv \frac{1}{(1+i)^n}$$

The above present value formula can be used to calculate the present value of the future costs and benefits of a program. Having set the discount rate, it follows that an investment program will be deemed acceptable if the sum of the discounted net benefits (benefits - costs) is positive. This sum is sometimes called the Present Net Worth (PNW) or Net Present Value (NPV) of the program, and the corresponding investment decision rule can be abbreviated to accept if (Anderson & Settle,1977):

$$NPV > 0$$

The Net Present Value could be an indicator of net profit of an enterprise (Gittinger, 1982). In other words, the net profit is the differences between relative benefits and relative costs. One may also do the calculation in separate parts by discounting the benefits (B) and the Costs (C) individually, in which case the rule becomes that the discounted benefits should exceed the discounted costs:

$$B > C$$

$$NPV = B-C > 0$$

In general terms then, once the future benefits have been translated into commensurable present value, $Bn/(1+i)^n$, they can be simply added together to obtain a measure of the total present value of all benefits (BPv):

$$BPv = B0 + \frac{B1}{(1+i)} + \frac{B2}{(1+i)^2} + \ldots \frac{Bn}{(1+i)^n}$$

$$= \sum_{n=0}^{n} \frac{Bn}{(1+i)^n}$$

Where Bn denotes the benefits expected during the nth year with i interest rate. Likewise, the discounted present value of all cost (CPv) can be obtained through the following analogous procedure:

$$CPv = C0 + \frac{C1}{(1+i)} + \frac{C2}{(1+i)^2} \ldots\ldots + \frac{Cn}{(1+i)^n}$$

$$= \sum_{n=0}^{n} \frac{Cn}{(1+i)^n}$$

Where Cn measures the anticipated costs for the nth year with i interest rate. Based on the above illustrations, the cost-benefit ratio can also be calculated as follows:

$$\text{The Cost-benefit ratio} = \frac{\sum_{n=0}^{n} Bn / (1+i)^n}{\sum_{n=0}^{n} Cn/(1+i)^n}$$

$$= \frac{BPv}{CPv}$$

Where :

Bn = benefits in each year

Cn = costs in each year

n = number of years

i = discount/interest rate

BPv = present value of benefits

CPv = present value of costs

Thus, net present worth and cost-benefit ratio of vocational programs can be calculated based on the measurable monetary value of outcomes and inputs. While the benefits in this study were discounted, costs were not discounted since the costs are considered to have occurred in a single time period.

An important issue in connection with calculating net present value or cost-benefit ratio based on cost-benefit analysis is the selection of the appropriate discount rate (Casler, Anderson, & Aplin, 1984). The discount rate is a crucial factor because it varies from time to time and also varies with anticipated inflation (Gittinger, 1982). At lower interest rates, a program may appear economically efficient because discounted benefits exceeds initial costs while at higher interest rate, the program should clearly be rejected on an economic basis of efficiency since costs exceeds benefits. One of the apparently vexing problems confronting the evaluator is how to estimate, with any degree of confidence, the discount rate. Anderson and Settle (1977) stated:

> it is simply not possible--given the present stage of development in the social sciences in general and in cost-benefit analysis in particular to accurately predict over the long run such things as population shifts, energy crises, taste changes, or technical innovations. Such things are sometimes difficult to accurately predict even over a one or two year period. (p.84)

However, alternative approaches such as the opportunity cost of capital and sensitivity analysis are available to use in determining the appropriate discount rate.

If there is flexibility in the selection of a discount rate, one conventional practice is to use a measure of the opportunity cost of capital in the private sector as the discount rate for public sector activities such as educationally oriented or human services oriented programs.

Some projects are evaluated according to cost-benefit analysis where the employed discount rate is not critical. The exact value of the discount rate may be critical in other situations. Examples involving such situations include mutually exclusive programs, budget constrained agencies, or a program that appears efficient for some discount rates but inefficient for others. When the exact value of discount rates is crucial, sensitivity analysis was performed which involved calculating the present value of benefits and costs for at least two alternative discount rates (Little & Mirrlees, 1974). Usually evaluators select two discount rates; a relatively low one and, a relatively high one in order to test the sensitivity of the cost-benefit estimates to changes in the discount rate. If cost-benefit measures prove to be insensitive to changes in the discount rate, using a particular discount rate will not be a problem. But, if it is sensitive to the particular discount rate, the evaluator must make that fact known to policy makers so that they might make their own judgements regarding the appropriate magnitude for the discount rate. In this study, the opportunity cost of capital accepted by the panel of experts was used as the discount rate.

## Limitations in Cost-Benefit Analysis

Before turning to the application of cost-benefit analysis in a realistic situation, it will prove useful to present the limitations in its uses:

1. A lack of information on costs and benefits may lead the evaluator to do impartial analysis of a program or project. That is, in many cases, noneconomic outcomes are not considered in cost-benefit analysis (Sassone & Schaffer, 1978).
2. Cost-benefit analysis fails to adequately bridge the gap between the underlying economic theory and its application in an actual study (Anderson & Settle, 1977). That is, there are no standard procedures available to determine the discount rate for public programs.
3. Since cost-benefit analysis stimulates the use of monetary values of outcomes, the ideal cost-benefit analysis may not be possible in all situations (Wentling, 1980). That is, all the outcomes are not marketable and therefore it is impossible to assign monetary values for those outcomes.
4. A program that is adjudged feasible by reference to cost-benefit analysis is, therefore, quite consistent with an economic arrangement that might make unequal income distribution among participants (Anderson & Settle, 1977). That is, programs that result in an

increase in the net benefits will receive favorable ratings by the cost-benefit evaluator. A favorable rating does not guarantee that everyone in society will be made better off.

## Summary

The first part of this chapter presented a brief overview of concepts of cost-benefit analysis. It included definitions of cost-benefit and cost-effectiveness analyses, discount factor, cost-benefit ratio, and net present worth. Arithmetic computational formulas of net present worth and cost-benefit ratio were also presented. Specifically, uses of cost-benefit technique in evaluating public programs were briefly mentioned. Finally, limitations of cost-benefit analysis were also given in this section.

## Cost-Benefit Analysis in Vocational Education

Cost-benefit analysis can be used for systematically developing useful information about the desirable and undesirable effects of public programs. However, it has a high degree of complexity when used in educationally oriented fields. A fairly extensive list of readings shows that cost-benefit analysis and cost-effectiveness analysis have been used to evaluate educational programs such as general educational programs (Quinn, Mondfrans, & Worthen, 1984; Spiegelman, 1968), on- the -job training (Mincer,

1962), upward bound educational programs (Garms, 1971), vocational rehabilitation programs (Conley, 1969), and other vocational education programs (Ghazalah,1975; Kim,1980; Nicoll, 1984). However, there is a great deal of interest in applying the concepts of cost-benefit analysis in evaluation of vocational education program because, as Warmbrod (1977) pointed out, vocational education programs are required to meet economic efficiency on the basis of outcomes and inputs. But, available measures of economic efficiency for vocational education are inadequate in that they are only partial analysis in nature (Haveman & Wolfe,1984).

Costs versus benefits assessment generally involves a simple accounting of all the costs and benefits encountered in a project or program (Gittinger, 1982). Accordingly, a cost-benefit analysis of vocational programs must be viewed in terms of costs and benefits components before the actual computational process begins with a given level of knowledge and the practical constraints of the purpose of study.

## Costs in Vocational Education

Costs in vocational education programs can be defined as any good or service a program uses towards the objective of the entity from the evaluator's standpoint for the analysis undertaken (Carr et al., 1982; Drake, 1982; Levin, 1975; Rothenberg, 1975). Thus, vocational education program costs

includes those funds and services expended through the program operating budget for a particular fiscal year. Costs can be broken down into program development costs and program operation costs (Wentling,1980). Accordingly, program development costs include all the costs related to implementation of programs which includes programming costs, design costs, evaluation costs, and implementation costs. On the other hand, program operation costs include the items such as instruction, buildings, equipment, administration, material and supplies, travel, and maintenance cost.

The program development and operation costs can be divided into social and private costs. Social costs are the opportunity costs to the society at large (welfare foregone to society from the use of resources in the program rather than in the production of other goods and services). Private costs are the opportunity costs to the individual (welfare foregone to the individual from the use of resources in the program rather than on other goods and services) (Ghazalah & Pejovich, 1973).

Further, cost can be divided into direct and indirect costs (Anderson & Settle, 1977). Accordingly, direct costs include all the costs incurred by the school in providing the specific program and the costs incurred by the individual due to the enrollment in the program. Indirect costs consist of foregone earning of the school and the students by participating in the vocational education

program (Ghazalah & Pejovich, 1973). The indirect cost is considered as the opportunity cost in this study. Levin (1975) has used "ingredients approach" to classify the costs in vocational education programs. The ingredients approach focuses on listing all inputs required by a vocational program and assessing costs to them only after all of the inputs are accounted for. Primarily, costs related to personnel, building, equipment, services, fringe benefits, travel, foregone earnings, depreciation, and administrative costs are considered in this approach. Depreciation is defined as "the anticipated reduction in the value of an asset over time that is brought about through physical use" (Gittenger, 1982, p.467). Accordingly, either straightline depreciation; which allocates the cost of a fixed asset in equal amounts for each accounting period; or accelerated depreciation; which allocates a larger proportion of the original cost to earlier accounting periods and a smaller portion to later periods must be used.

## Benefits in Vocational Education

Benefits in vocational education can be defined as any good or service produced by a program that furthers the objectives of the entity from the evaluator's standpoint. Benefits include both economic and noneconomic outcomes accrued as a result of the vocational education program (Haveman & Wolfe, 1984; Warmbrod, 1977; Wentling,1980). The

concept of benefit has no meaning by itself but only in association with an objective (Maass, 1966). Thus, the benefit issue becomes less clear if the vocational education program has poorly defined objectives. In fact, estimation of benefits of vocational education programs can be challenging to evaluators (Carr et al., 1982).

Ghazalah and Pejovich (1973) have classified benefits of vocational education programs into social and private. Accordingly, social benefits mean welfare gained by society at large from the individual's training in the program. This is, increased output attributable to the individual's training in the program. Private benefits mean welfare gained by the individual from training in the program; that is, increased earnings attributable to the individual's training in the program. Benefits accruable from a vocational education program include both economic and noneconomic benefits (Haveman & Wolfe, 1984; Kim, 1980; Wentling, 1980). Economic benefits of vocational programs are measurable outcomes which can be traded for money or the terms on which commodities can be traded for one another. Noneconomic outcomes are ones which do not have market value and are not susceptible to quantitative measurements.

## Adjusting and Assessing in Vocational Education Analysis

Evaluation of vocational education programs based on costs and benefits involves more than gathering the necessary data and grouping them into appropriate costs and benefits analysis. The evaluator has to determine the economic value of the inputs and outcomes from the perspective of time involved in a program (Rothenberg, 1975). This process includes the following:

1. Adjusting for inflation, and
2. Assessing opportunity values.

### Adjustment for Inflation

The adjustment for inflation is important in cost-benefit analysis. The inflation adjustment must be done with an appropriate interest rate; in this case it can be called social discount rate (Anderson & Settle, 1977). This is necessary because the same expenditures in high and low inflation years have different economic values (Casler et al.,1984; Dowd, 1980). Moreover, vocational education programs incur their heaviest costs in early years. In contrast, vocational education program's major benefit of graduates' income begins at graduation. Therefore, their economic value might be substantially different between these time periods. A very serious misallocation of resources can result from the use of an incorrect estimate of the value of this variable in a cost-benefit calculation (Baumol, 1968).

As mentioned earlier, the concept of discounting can be used to overcome the inflation problem. Four discounted measures, net present worth, internal rate of return, cost-benefit ratio, and net benefit investment ratio are available for this purpose (Gittinger, 1982). According to Christensen and Pontius (1983), present value analysis appears appropriate for public investment programs. It is very crucial to select and use appropriate interest rates to calculate net present value. Personal discussion with Dr. J.Dale Oliver, a professor of vocational and technical education, revealed that since vocational education uses public dollars to fund its programs, an average of both literary fund loan interest rate (4%) and current money market saving account interest rate (9%), 6.5%, can be used as the interest rate in this case (Personal Communication, February 11, 1985). This suggestion was accepted by the members of panel of experts.

Assessing Opportunity Values

In vocational education, opportunity costs include the lost efforts of both school and students by participating in the program. From the school's point of view, it represents the value of opportunities foregone by redirecting resources from one program to another program. In order to value the opportunities forgone to the school by expending resources in one vocational program rather than

another productive vocational program, the evaluator must estimate the value of such expenditures. One measure of opportunity costs, for example, is the profit contribution of an alternative program that is lost when it is interrupted for redirection of resources of the new program (Mishan, 1976). The evaluator has to assess the value of the lost outcome or services. This principle applies as well to time, supplies, and facilities volunteered or contributed to the program. From the student point of view, opportunity costs consist of all foregone earning by being enrolled in a vocational education program (Ghazalah & Pejovich, 1973). However, in this study the opportunity cost was considered as zero because students chose not to enter the labor market, but, instead enrolled in a specific vocational education program.

## Cost-Benefit Analysis Model of the Study

The Vocational Education Act of 1963 and its amendments have lead vocational administrators, public officials, and economists to evaluate vocational education programs in terms of their economic and noneconomic consequences. As pointed out earlier, the cost-benefit approach has been used by many economist and educators, but not by local vocational administrators to evaluate vocational education programs. The focus of the cost-benefit approach was the means and ends relationships (Rothenberg, 1975). In other words,

vocational education programs have been evaluated in terms of costs and benefits. The costs and benefits have been related through the actual process of vocational education programs (Fleischman et al., 1983). Thus, evaluation of vocational education programs based on cost-benefit analysis must consist of costs, processes, and benefits. In order to explain the relationship among the costs, processes, and benefits, a cost-benefit model was developed to evaluate a secondary vocational education program.

## The Model

The term model is defined as a simplified abstraction of the appropriate real situation (Qayum, 1966). That is, the model must demonstrate that a systematic relationship exists between investment in training and skill development on one side and the outcomes or benefits on the other (Ghazalah & Pejovich, 1973). As Ghazalah and Pejovich (1973) pointed out, cost-benefit analysis must develop a model because without such a model, it would be difficult to evaluate vocational education programs in terms of costs and benefits. The cost-benefit study based on the model must be interpersonally as well as publicly communicable and justifiable (Rothenberg, 1975). That is, the model must be practical enough to use by the vocational administrators and to be understood by the taxpayers in the general public.

In using cost-benefit analysis to evaluate a secondary vocational education program, it is desirable to describe clearly the vocational education program and its participants or owners. There may be at least three major participants or owners of costs and benefits that need to be considered in cost-benefit analysis--the school, student, and society (Wentling, 1980). But at times, all three may have separate desires and interests in terms of vocational education programs (Steele, 1971). In the past, costs and benefits of vocational education programs have been evaluated not in terms of participants but in a combined manner as a whole (Ghazalah,1975; Hu, Lee, & Stromsderfer, 1971; Rothenberg, 1975). The public is concerned about what schools are doing with the tax dollars they spend. Realistically, the public image of the school is dependent to a great extent upon the profitability of those vocational programs offered by the school (Carr et al., 1982; Fleischman et al., 1983). The school can be visualized as an "education industry" that takes students and other school resources as inputs and produces economic and noneconomic outcomes through a process (Spiegelman, 1968). Based on the above understanding a cost-benefit analysis model has been developed. Figure 1 shows the conceptual framework of the model.

The model should answer the following questions related to cost-benefit evaluation of secondary vocational education program (Rothenberg, 1975):

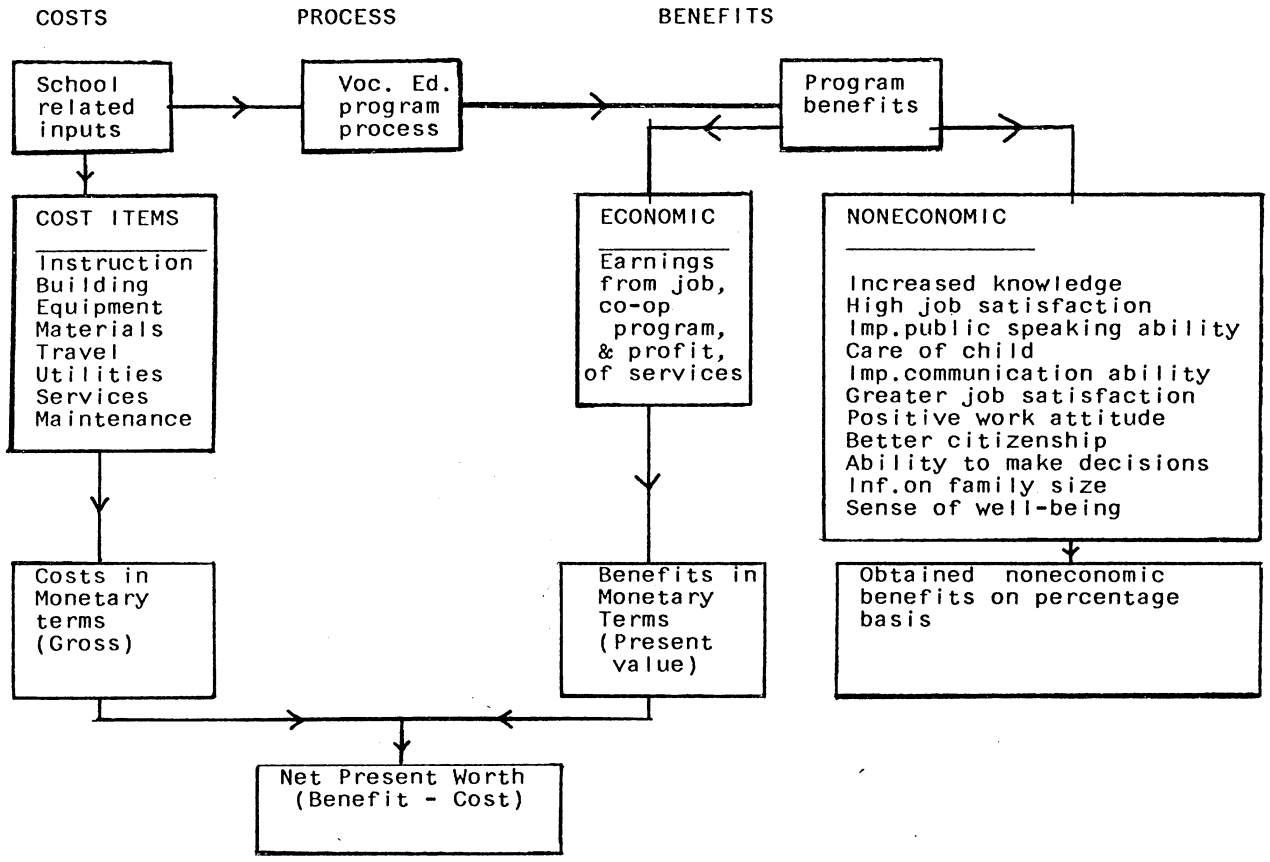


Figure 1: Cost-benefit Analysis Model of a Vocational Education Program

1. What resources?
2. What outputs?
3. What value?
4. What relationship?
5. Whose point of view?

However, in an attempt to find answers to the above questions, the evaluator must choose what is most appropriate to the particular vocational education program.

## Application of the Model

Application of cost-benefit analysis for evaluating a vocational education program may be a complex approach. However, using cost-benefit analysis in vocational education may produce a better understanding of that complex phenomenon for future references (Steele, 1971). Identifying and valuing all the vocational education program inputs and outcomes is not possible all the time for all vocational education programs (Hu et al., 1971). This is especially true in the case where both economic and noneconomic outcomes are considered. However, the problem remains in vocational education evaluation unless, and until, intellectual compromises are made and efforts are taken continuously to solve them by experimenting with the programs using a cost-benefit analysis model particularly at the school district level.

## Program Costs

Vocational education programs are considerably more expensive than general academic education (Hu et al., 1971). Therefore, it is important that the calculation of costs includes all the components of the costs of particular vocational education programs. Since there are differences from one program to another, not all vocational programs cost the same with the same components of cost such as instructional personnel, buildings, equipment, utilities, materials, travel, and administration and supervision (Asche & Salmon, 1979). Accordingly, each program costs must be calculated or prorated separately. Asche and Salmon (1979) have quoted various authors such as Hale (1975); Horngreen (1972); Robert, Lichtenberger, and Kim (1976); and Somers (1971) to show that there is little agreement among them not only as to which costs should be included in cost calculation but also in allocation of costs to specific program areas. In fact, there is no standardized method adopted in vocational education to calculate the program costs. However, individual program costs can be prorated from the total program costs (Levin, 1975).

### Instructional Personnel Costs

Instructional personnel costs have been calculated many ways such as clock hours (Asche & Salmon, 1979), and amount of time spent in each program or full time equivalent

(Eggland et al., 1980; Kim & Harris, 1976). In this model, the amount of instructional time spent in each vocational education program was used to determine the instructional personnel costs. From the administrative office of the school's division, it was determined that the fringe benefits paid by the school system amount to 25% of the salaries of instructional personnel.

Building Costs

Building cost reflects the cost of using a building by the vocational program for a fiscal year. The building cost is determined by square footage costs for vocational education (Asche & Salmon, 1979). The annual cost of using the building for the specific vocational education program could be determined by dividing the total cost of the building by its life expectancy (Asche & Salmon, 1979; U.S. Office of Education, 1973). In this model, straightline depreciation was used to calculate the annual cost of the building. Building cost for a vocational education program could be calculated as follows:

Average square foot costs is = X dollars

Total square footage = Y

Total cost for building = Y * X dollars

Life span of the building = Z years

$$\text{Building cost/school year} = \frac{YX}{Z} \text{ dollars}$$

However, opinions obtained from the panel of experts revealed that if there is a considerable difference between the original and current square footage cost of building and no record of past maintenance, replacement cost of building can be used to calculate the building cost. A telephone conversation with Dr. Glen Earthman, an associate professor in the Division of Administrative and Educational Services, College of Education, Virginia Polytechnic Institute and State University revealed that $50.00 per square foot cost and a life expectancy of 50 years per building in Virginia are currently used (Personal Communication, January 30, 1985). Accordingly, the above square footage cost and life expectancy were used in this model for prorating building costs. In prorating the annual building costs for vocational programs, considerations must be given to the size and time used for the program (Kim & Harris, 1976).

Equipment Costs

Equipment costs of a vocational program include the annual depreciation costs of equipment, including furniture, used during the fiscal year. Depreciation costs can be estimated by dividing the value of equipment by an appropriate life expectancy (Asche & Salmon, 1979; Kim & Harris, 1976). Equipment costs for a vocational program can be calculated as follows:

| | |
|---|---|
| Total equipment costs | = A dollars |
| Lifespan of equipment | = B years |

$$\text{Annual equipment cost} = \frac{A}{B} \text{ dollars}$$

The panel of experts suggested that if there is no record of maintenance and purchased costs of equipment available, it is wise to use the current value of the equipment with appropriate lifespan. The panel of experts also suggested that the appropriate lifespan could be determined depending upon the equipment size and cost. Accordingly, larger and more expensive pieces of equipment usually have a longer lifespan and the smaller and less expensive pieces of equipment have a shorter lifespan. Thus, lifespan may range from 5 to 20 years. The panel of experts suggestion was used in calculating the equipment cost of this model.

Materials and Supplies Costs

The materials and supplies costs include the annual expenditure for materials and other consumable supplies used for instructional purposes in vocational programs. If these expenditures are not available on the basis of individual programs, it is necessary to prorate the program costs from the total vocational education program costs available from the school system. The costs related to a specific program could be prorated on the basis of the proportion of students compared to the total enrollment in the vocational education system (Kim & Harris, 1976). However, to avoid double counting in cost calculation, proportionate comparison must

be done on the basis of full time equivalent (FTE) students. Five students for an hour or five hours for a student in a program of instruction represents one FTE in Virginia (VEMS, 1984). If costs information is available on an individual program basis, it could be used in the calculation of materials and supplies costs. In this model, the total cost was used to calculate the material and supplies costs of a program.

Administrative Costs

The administrative costs are related to coordination, supervision, monitoring, and evaluation of vocational programs. The school administration services costs can be prorated for a vocational program on the basis of proportion of students in the vocational program compared to the total enrollment in in the school (Kim & Harris, 1976). The administrative costs are usually fixed by salary (Eggland et al., 1980). In this model, the proportion of students in the program compared to the total enrollment in the school on a FTE basis was used to prorate the administrative cost.

Travel Costs

The travel costs include expenditures for all travel that occurred as a part of the instructional activities of the vocational programs. The travel cost can be calculated based on the total travel cost for each teacher in the program.

Maintenance Costs

The maintenance costs consist of upkeep of equipment, building in which the vocational program is conducted, and other wear and tear. The maintenance cost for the program can be prorated from the total maintenance cost in the school budget. In many cases, the maintenance cost can be added and prorated with annual equipment and building costs. Proportion of students in the program on an FTE basis compared to the total enrollment in the school could be used to prorate the maintenance cost. In this model, the total school division maintenance cost for 1983/84 fiscal year was prorated to each program.

Service Costs

Service costs are the amount paid for custodial service, pupil transportation, food, and other services. For analytical purposes, a single program cost can be prorated from the total annual school cost of such services. Proportion of students compared to the total enrollment in the school could be used as a basis for prorating this cost (Kim & Harris, 1976). In this model, the proportion of students on an FTE basis compared to the total enrollment in the school was used in prorating the service cost. Food service was not considered as a cost in the field test site as it operates on a break-even basis.

Utility Costs

Utility costs are amounts paid for electricity, water, sewer, fuel, and telephone for the operation of the school system. The program costs can be prorated from the total amount paid by the school for each category during the fiscal year. The proportion of students in the program on an FTE basis compared to the total enrollment in the school could be used as basis for the calculation of this cost. The panel of experts opinion revealed that although different types of programs could have used varying amounts of utilities, it is legitimate to use the total school cost on utilities if detailed cost information is not available for individual programs or program areas. Thus, the proportion of students in the program compared to the total enrollment in the school was used to prorate the utility cost in this model.

It is important to note that total costs were not discounted, because in this model, total program cost of fiscal year 1983/84 was attributed to the students who graduated rather than splitting them between first year and second year students of each program and prorating the total program costs for two years.

## Program Benefits

Vocational education is a form of public investment in human resource development (Ghazalah, 1975). In this context, vocational education produces "graduates" and "services" as its outcome. This outcome consists of both economic and noneconomic values (Rothenberg, 1975).

### Economic Benefits

Economic benefits of vocational education have been measured by "increased earning power of vocational education program participants" (Ghazalah, 1975; Spiegelman, 1975). The increased earning by program participants was considered a primary indicator of the economic earning in many cost-benefit studies (Conley; 1969; Garms, 1971; Ghazalah,1975). Accordingly, the increased earning has been considered as an additional income obtained by graduates of vocational programs compared to either comparable graduates of nonvocational educational program or income calculated by using the current Federal minimum wage. In this model, the Federal minimum wage of $3.35 per hour was used to determine the increased earning power of the vocational graduates. Members of the panel of experts suggested using the average number of hours per week worked by the vocational graduates, be used instead of standard 40 hours per week as a basis for determining the comparable income of the Federal minimum wage. This comparison will maintain the reality and

equality in calculating the increased economic income of this model. It was assumed the Federal minimum wage will not change for the next five years. The assumption made is that the increased income which a vocational graduate receives upon completion of the program is due to the fact that she/he completed the program (Ghazalah, 1975). The earning information could be obtained from a follow-up study of graduates. If the follow-up data are not available, the earning power of graduates could be estimated from the salary or wages for the specific job or service paid by the employee in the local community (Fleischman et al., 1983). In addition to the salary, vocational students, in many cases, earn money as a result of their participation in cooperative placement programs. This income could be added to the first year economic benefits.

Ghazalah (1975), Garms (1971), Hu et al. (1971), and Kim (1980) have considered five years of increased earning from employment attributable as benefits to students. There is no specified number of years of earning attributed as the benefits to the school. However, the panel of experts have suggested the need to indicate the present value of the increased earning of students for five consecutive years as an attributable benefit to the school. In calculating the earning of vocational students, 80% employment rate and a 3% of annual salary increases have been used in the past (Ghazalah, 1975). In this model, the actual employment rate

obtained from the survey and 3% annual salary increase were used to calculate the present value of increased earning power of the graduates for five consecutive years.

Noneconomic Benefits

Vocational education programs produce both economic and noneconomic benefits. However, there has been a failure to include noneconomic values in cost-benefit studies in the past (Haveman & Wolfe, 1984). It has been pointed out that it is difficult to express noneconomic outcomes in terms of their market values because a market does not exist for such service or outcome (Kim, 1980; Levin,1975). However, noneconomic benefits such as increased knowledge, high job satisfaction, improved public speaking ability, care of child, improved communication ability, greater job opportunities, positive work attitudes, better citizenship, ability to make better decisions influence on family size, and greater sense of well being have been identified by the author and accepted by the Roanoke County School Division vocational advisory council as important to the total picture of benefits received from vocational education programs. The noneconomic benefits can either be observed by vocational teachers and supervisors who work with students, or can be determined from the responses indicated by students during the follow-up survey. The word benefit has no meaning by itself (Maass, 1966). Therefore, the

consideration of objectives of the vocational program must be given primary attention in calculation of benefits, both economic and noneconomic.

## Profitability of Vocational Program

Cost-benefit analysis evaluation has been conducted to determine whether or not the investment is worthwhile in the vocational education program (Garms,1971; Ghazalah, 1975; Hu et al., 1971). Once the relative costs and benefits of the vocational education program have been valued in monetary terms, the next step is to use the gross costs and the discounted benefits to find out the profitability of the vocational program, i.e., to determine the relative gain in the benefits compared to the relative cost of the vocational program. According to this model, if the benefits are greater than the cost, the vocational program could be considered as profitable in its investment. The following formula was used to calculate the net profit of the vocational program.

Net Profit = Discounted Benefits - Gross Costs

In using the cost-benefit analysis model, the researcher has taken a practical approach to calculate cost and benefits so that the cost-benefit analysis model can be utilized by vocational administrators as an aid in decision making. Also it can be used to demonstrate the worth or profit of

conducting a specific vocational education program (Rothenberg, 1975). Therefore, the primary analytical task in this model is the calculation of net profit of secondary vocational programs.

## Summary

The second part of this chapter includes literature related to the application of cost-benefit analysis in vocational education. Although there is a fairly extensive list of readings available on cost-benefit analysis of vocational education programs, studies have been conducted by economists or by educators with assistance of economists beginning primarily with passage of the Vocational Education Act of 1963. But, the practical feasibility of those studies is generally beyond the abilities of vocational administrators. There is no practically adoptable cost-benefit analysis model available for the administrators to analyze the benefits from the point of view of the school.

Costs in vocational education programs have been characterized in many ways such as program development costs, program operation costs, direct and indirect costs, ingredient costs, and opportunity costs. In calculating costs, the ingredient costs approach seems to be useable at the local level.

Benefits of vocational education programs include both economic and noneconomic outcomes. Noneconomic benefits have been considered as difficult to assign a monetary value. Therefore, cost-benefit analyses have generally excluded the consideration of noneconomic outcomes of the vocational education program in the past.

Analysis of vocational education programs based on cost and benefits involves more than gathering the necessary data for analysis. Adjustment for inflation and assessment of opportunity costs are important activities in cost-benefit analysis. Adjustment for inflation is related to selection of the appropriate interest rate for discounting the future costs and benefits to their present value. In vocational education, opportunity costs include the lost effort of both school and students by participating in the program. Wherever necessary, evaluation has to assess the value of those lost outcomes or services.

The cost-benefit analysis model should analyze the net profit of vocational education programs. Calculation of costs should be completely based on the ingredient approach such as instructional personnel, building, equipment, material, administration, travel, services, maintenance, and utilities. The amount of instructional time used by the teachers should be used to calculate the instructional personnel cost. The concept of average square footage costs for school buildings needs to be used to calculate building

costs. The life expectancy and square footage cost of building were recommended as 50 years and $50.00 respectively. Equipment cost should be determined based on the annual depreciation cost. Depending on the types of equipment, life expectancy of equipment should be used as 5 to 20 years in calculating the annual equipment costs. Administration cost, service costs, maintenance costs, and utility costs should be prorated using the proportion of students in the program compared to the total enrollment in the school on the basis of full time equivalent (FTE). The total costs should not be discounted since all the costs are considered to occur in a single time period.

Increased earning power of vocational education program participants and earnings from the cooperative program should be considered as a measure of the economic benefit of vocational education programs. Follow-up data can be used to calculate economic earning. Calculation of noneconomic benefits are also proposed. Increased earning received by students from employment after graduation compared to the Federal minimum wage, and earning from participation in cooperative vocational programs were the major components in the calculation of of benefits in this model. Since there is a relationship between the outcome and the time period, all benefits have been discounted to present values by using 6.5% interest rate.

The primary analytical task should be calculating net present profit of vocational education program. Thus, it would be possible for vocational administrators to demonstrate the profitability of vocational education programs for their critics and to aid in decision making.

# CHAPTER 3

## METHODOLOGY

The purpose of this chapter is to describe the methodology used for the study. This chapter includes a description of the cost-benefit analysis model, use of panel of experts, field test of the model, evaluation of the model, and determination of its transportability. The primary objective of this study was to develop and field test a cost-benefit analysis model to determine the profitability of a secondary vocational education program. The methodology must be appropriate to the objective of the study (Borg & Gall, 1983). The research methodology used in this study was descriptive in nature, using descriptive statistics such as totals, means, and percentages in the field testing of the model. Accordingly, the methodology of establishing and using a cost-benefit analysis model for a secondary vocational education program accomplished the following procedures:

1. Propose a cost-benefit analysis model for a secondary vocational education program.
2. Seek opinion of a panel of experts relating to needed revision in the cost-benefit analysis model.

3. Field test the model to determine its feasibility.
4. Evaluate the cost-benefit analysis model.
5. Determine the transportability of the cost-benefit analysis model to other secondary vocational education program settings.

The cost-benefit analysis model used in this study consisted of inputs, process, and outcomes. Accordingly, costs and benefits were identified to calculate the net profit of a secondary vocational education program. The cost-benefit analysis model specifically considered four programs representing the four service areas of trade and industrial, occupational home economics, business education, and marketing and distributive education as part of the Roanoke County School Division, Virginia.

## Calculation of Costs

The four selected vocational programs were individually analyzed by using the components of costs and benefits of the cost-benefit analysis model identified in the previous chapter. The costs of each program were prorated based on the total costs for fiscal year 1983-84.

### Instructional Personnel Costs

Instructional personnel costs considered the salaries and fringe benefits paid to the teachers in the four vocational education programs. Instructional personnel costs were

determined from the salary records available in the central school division office. Because vocational teachers in all four programs areas were employed on a full-time basis, the annual salary was used to prorate instructional costs of each program based on the percentage of instructional time spent by the teacher.

Building Costs

Building costs included the expenditures incurred to provide needed space for each of the selected vocational education programs in the study. The building cost was prorated by using the average square footage cost to construct public schools in Virginia in 1985. The size of building used for each program was obtained from the central school division office. The building costs for fiscal year 1983/84 was determined by dividing the building costs of the program by 50 years.

Equipment Costs

The total amount of current value of equipment owned for each selected vocational education program was used to prorate the annual costs of equipment in this study. The current value of equipment was obtained from the central accounting office of the school division. The current value of equipment was divided by an appropriate lifespan, either 5, 10, 15, or 20 years, to determine the annual cost of equipment for the each program.

Materials and Supplies Costs

Materials and supplies costs included the total amount of dollars spent on such items as textbooks, and other consumable supplies and materials used for the four selected vocational education programs. Materials and supplies costs data were obtained from the central accounting office of the school division. Total costs for 1983/84 were used to determine the program costs.

Administrative Costs

Administrative costs consisted of salaries of principals, secretaries, counselors, vocational administrators, teacher support services, fringe benefits, and the school audit. The administrative costs for the selected programs were individually prorated from the salaries paid for the personnel for the 1983/84 fiscal year.

Travel Costs

Travel costs were determined from the travel vouchers available from the school administrative and accounting system. The total vocational travel costs which were directly related to the selected four vocational education programs were included in this cost analysis.

Utility Costs

Utility costs data for the 1983/84 fiscal year were obtained from the central accounting office of the school division. The annual costs of utilities were part of the individual program costs. Although different programs could have used varying amounts of utilities, lack of details on an individual program basis have led the researcher to use the total costs of the school system on a prorated basis.

Service Costs

Costs of transportation of pupils was obtained from the central accounting office of the school division. Annual costs of these services for 1983/84 fiscal year were used in prorating this cost.

Maintenance Costs

Maintenance costs included maintenance of building, equipment, custodial supplies, and other wear and tear which occurred to the program or school for the 1983/84 fiscal year. The total maintenance costs were obtained from the central school division office and prorated to help determine each program costs.

Adjustment Factors

In prorating costs for each program area, total costs incurred in the fiscal year 1983/84 were attributed to the final year students. Because the selected four vocational education programs each consisted of two years of classes, it was decided to attribute the total costs of the fiscal year to the final year graduates instead of splitting them among each class and prorating them. This procedure saved having to determine fractional costs for the previous years when members of the current graduating class were first year students.

The total costs of building and equipment were equally split among the years of life expectancy. The foregone earnings of students were considered as zero in this study. Moreover, since the cost-benefit analysis model was developed and tried out from the point of view of the school, the researcher presumed that it was not appropriate to consider the opportunities foregone by the students in the costs calculations. From the school's point of view, the opportunity costs of resources used were considered zero because the allocated money must be spent only during the fiscal year and cannot be used in long term alternative investments opportunities by the school.

The related information needed for prorating costs for each program area was gathered from the school division's central accounting office. Each cost item analyzed was

summed to get gross total costs for the individual program. The gross total costs were not discounted. Table 2 shows the components of the major costs, sources of information collected, and the criteria used to determine the value of each cost.

## Calculation of Benefits

The selected vocational education programs produced both economic and noneconomic outcomes. Accordingly, the following benefits were obtained from the four programs:

1. Increased income from graduate's employment.
2. Income from the provision of services.
3. Income gained from cooperative placement of students.
4. Noneconomic benefits such as leadership skills, positive attitudes, increased morale, and personal development skills.

### Data Collection For Benefits

Increased earning from employment after the students' graduation was considered as the income earned as a result of vocational education. A follow-up survey was conducted to determine the income of graduates in each program. A modified graduate follow-up questionnaire used by the Roanoke County School Division was used in this study (Note appendix A). An additional three questions relevant to economic and noneconomic benefits were included in the

Table 2
Components of Costs, Information Sources, and Valuing Criteria

| Components of major costs | Sources of information | Valuing criteria |
|---|---|---|
| Instructional personnel | | |
| Salaries | Salaries and fringe benefits records | 100% Vocational cost |
| Fringe benefits | | |
| Buildings | Buildings records | Prorating annual costs based on current square footage cost |
| Space | | |
| Equipment & furniture | Inventory file. | Prorating annual costs based on current values |
| Materials and supplies | Purchase vouchers | 100% Vocational costs |
| Textbook | | |
| Others | | Prorating annual costs |
| Administration | School salary records | Prorating from the school cost |
| Personnel | | |
| Supplies | | |
| Others | | |
| Travel | Travel vouchers | 100% Vocational costs |
| Utilities and Services | Use of vouchers, salaries and wages | Prorating from school costs |
| Electricity | | |
| Water | | |
| Custodial services | | |
| Others | | |
| Maintenance | School records | Prorating from school cost |

questionnaire with the approval of the Roanoke County Vocational Advisory Council members and central office personnel. A review of the questionnaire by principals, teachers, and other administrators indicated that graduates should be able to understand and complete the additional questions. Thus, content validity and reliability of the questionnaire was confirmed. The questionnaire, printed on yellow paper, was mailed to the graduates on January 28, 1985. A cover letter (Note Appendix B) signed by the graduates' former teachers was included with the questionnaire. An additional incentive in the form of a piece of gum was enclosed with each questionnaire. Because all the graduates were considered as subjects in each program, sampling was not used in the data collection. Following the mailing of the questionnaires, a reminder postcard (Note Appendix C) was sent to each participant on February 4, 1985. Miller and Smith (1983) have suggested that above mentioned strategies would increase the rate of response of a mail questionnaire survey.

Nonrespondent subjects were sent another questionnaire and cover letter (Note Appendix D) on February 14, 1985. The nonrespondents left after the mailing of the second questionnaire were contacted by telephone on February 23, 1985 and asked the three questions used for this study. A 73.9% return was obtained from the mail questionnaire. Table 3 shows the sample and its return for each program area.

Table 3
The Sample and Questionnaires Returned by Program Area

| Program area | Total n | Returned n | Percentage returned |
|---|---|---|---|
| Trade & indus. | 12 | 10 | 83.3 |
| Occ.home econ. | 7 | 5 | 71.4 |
| Business ed. | 10 | 9 | 90.0 |
| Mar.& dis ed. | 17 | 10 | 58.8 |
| Total | 46 | 34 | 73.9 |

Increased Earnings from Employment

Increased earnings from employment was determined by using the data obtained from the follow-up survey in comparison with the Federal minimum wage. Present value of the increased income was calculated for four consecutive years following graduation for each of the four programs. Totals and percentages used in the calculation procedures were obtained through the SPSSx (1983) computer program.

Income from Cooperative Education Placement

In addition to the classroom experiences, students in all four selected programs were given an opportunity to improve their practical skills through cooperative placement. Students also earned an income as a result of the placement experience while they were in school. Such income data were obtained from records available from each program area at schools. The total income derived from their work was added to the first year benefits in the cost-benefit analysis model.

Income from the Provision of Services

Income from the provision of service was added to the first year benefits. Only the occupational home economics program provided service for a fee to the general public. Profit obtained from provision of services was gathered from the program area in the school. Because this profit was an

income in the program's budget, it was included in the benefit side of the cost-benefit analysis model.

Noneconomic Benefits

Although economic benefits were the primary consideration in the process, attention was given to noneconomic benefits which were common to the selected vocational education programs. Students' responses in percentage of obtained noneconomic benefits were determined in the calculation. However, the noneconomic benefits of the selected programs were not converted to an economic basis.

Adjustment Factors

The benefits valued in monetary terms were summed and discounted to the present value by the discount factor. Because, the benefits were expected to occur over a period of five years, it was necessary to discount the future benefits to present value. The first year income was not discounted. Discount factors for second through fifth years were calculated as follows:

$$\text{The discount factor} = \frac{1}{(1+.065)^{n}}$$

$$\text{2nd year discount factor} = \frac{1}{(1+.065)^{2}} = 0.88$$

$$\text{3rd year discount factor} = \frac{1}{(1+.065)^3} = 0.83$$

$$\text{4th year discount factor} = \frac{1}{(1+.065)^4} = 0.78$$

$$\text{5th year discount factor} = \frac{1}{(1+.065)^5} = 0.73$$

Table 4 shows the benefits, sources of information, and the criteria used to value them in the determination of benefits in the cost-benefit analysis.

The net profit was the final calculation in the testing of the model. If the present value of the net profit was positive the vocational program considered in that particular analysis was economically profitable.

## Panel Evaluation of the Model

A panel of experts consisting of a group of professionals who were knowledgeable of the accountability and reporting process was selected to evaluate the model. The panel of experts consisted of four members including a vocational administrator, a teacher educator, an economist, and state advisory council executive director (Note Appendix E).

Table 4
Benefits, Sources of Information, and Valuing Criteria

| Components of benefits | Sources of information | Calculation criteria |
|---|---|---|
| Salaries/wages | Follow-up data | Mean salary from follow-up data |
| Income from provision of services | Sales tickets | Unit fee |
| Income from cooperative placements of students | Sales tickets, records | Unit price, wage rate |
| Noneconomic benefits Leadership skills attitudes, etc. | Follow-up data | Students response |

Members of the panel were purposively selected. The panel of experts was given a brief outline of the model and the calculation procedure on January 2, 1985 for their suggestions and opinions. Suggestions and opinions rendered by the experts were used to revise and refine the cost-benefit analysis model of the secondary vocational education program. The members of the panel of experts were contacted via mail and on a one-to-one personal interview basis.

## Field Testing of the Model

The major purpose of this study was to develop and field test a cost-benefit analysis model to determine the profitability of a vocational education program. To accomplish this purpose, the model was field tested in a real situation. The Roanoke County School Division was purposively selected for this study because it consisted of more than one comprehensive high school and an area vocational center at the secondary level. Therefore, the confidentiality of the schools and specific vocational programs could be maintained. Further, generous cooperation and enthusiasm were shown by the administrators, principals, and teachers from the school division. One comprehensive high school and one area vocational center were purposively selected for this study. Four program areas namely, trade and industrial, occupational home economics, business

education, and marketing and distributive education were purposively selected with the help of the vocational administrator for the school division. The researcher was asked to follow the terms and conditions of information for the personnel engaged in graduate research for Roanoke County Schools (Note Appendix F). Thus, the researcher did not identify the name of the schools and programs.

Four visits were made by the researcher to the school division's central administration office and to the school sites to gather data related to costs and benefits of the selected programs.

## Evaluation of Model

The model was designed to demonstrate the systematic relationship among its components, in this case, costs, process, and benefits. After a model has been developed for analysis, the next step is to find out whether or not it is useful (Nunnally & Durham, 1975). The cost-benefit analysis model for vocational education programs was evaluated based on its useability. The useability in this study is considered as the extent to which the model can be used by vocational administrators. That is, the adaptability of the model (Suchman, 1969).

A cost-benefit analysis model must be technically sound and practical enough to be used by the program staff and third party evaluators (Fleischman et al., 1983). In this

study, the model must be practical enough to be understood by the administrators as well as clearly perceivable by the funders, supporters, critics, and the users of vocational education programs. Based on these perspectives, useability was considered appropriate to evaluate the model and was determined by the panel of experts.

## Transportability of the Model

In this study, transportability of the model was defined as the extent to which the cost-benefit analysis model was feasible for use in other vocational education settings. Findings of the field testing were given to the members of the panel of experts on March 4, 1985 for their opinions on the useability and transportability of the model.

## Summary of Chapter

The purpose of this chapter was to describe the methodology for field testing a cost-benefit analysis model of a vocational education program. It included a description of the cost-benefit analysis model, use of the panel of experts, field testing the model, evaluation of the model, and transportability of the model.

The cost-benefit analysis model identified in chapter two was used in this study. It included costs, process, and benefits. A four member panel of experts was used to gather opinions and suggestions needed to revise the proposed

cost-benefit analysis model. The revised cost-benefit analysis model was field tested in Roanoke County School Division, Virginia. Four vocational education program areas were selected for field testing the model. The programs were individually analyzed in terms of costs and benefits.

The cost-benefit analysis model was evaluated for its useability and transportability. Both were determined by a panel of experts.

# CHAPTER 4

# FINDINGS

The purpose of this chapter is to present cost and benefit information collected through the field testing of the cost-benefit analysis model in the Roanoke County School Division, Virginia. The primary objective of this study was to propose and field test a cost-benefit analysis model to determine the profitability of vocational education programs at the secondary level from the point of view of the school. A cost-benefit analysis model was developed through a review of literature of available cost-benefit studies in the area of vocational education and its related fields.

## Costs, Benefits, and Net Profit of the Trade and Industrial Program

A trade and industrial program was one of the vocational programs studied. Twelve of 16 seniors enrolled graduated from this program during 1983/84. It has cooperative placement. In 1983/84, the total enrollment in the area vocational center was 388.

Ten responses (83% return) were obtained from the mail questionnaire survey of the graduates of this program. One full-time teacher was employed for this program. The total

square footage used in the building for this program was 2,583. The building was built in 1963 at the cost of $10.27 per square foot. There were no records of building maintenance costs available. Therefore, current replacement cost of the building was used in building calculation. On a current value basis, $79,966.00 worth of equipment belong to this program. There was no record of equipment maintenance cost available. To compensate for the nonavailability of maintenance costs of equipment, current value of replacement equipment was used with 10, 15, and 20 years of life expectancies. Table 5 shows the total costs of the trade and industrial program for 1983/84.

The following incomes were considered as economic benefits in the trade and industrial program:

1. Increased earnings from employment of graduates.
2. Earnings from cooperative placement of students while in school.

According to the survey, 100% employment rate was obtained by the respondents. The average number of hours worked per week by the graduates of this program was 42.7. The total monthly income of all graduates was $7,740.00 with an annual income of $92,880.00. The comparable monthly income on the basis of the minimum wage was calculated as $5,721.80 with an annual income of $68,661.60. Thus, the increased annual income was $24,218.40. The earnings from cooperative placement was $48,000.00. Thus, the total first

Table 5
Costs of the Trade and Industrial Program for 1983/84

| Cost components | Annual cost |
|---|---|
| Instructional personnel | $29314.38 |
| Building | 2583.00 |
| Equipment | |
| Large | 2886.90 |
| Medium | 1281.86 |
| Small | 300.00 |
| Materials & supplies | |
| Textbook | 331.90 |
| Other consumable | 1194.30 |
| Administration | |
| Principals | 1981.80 |
| Secretaries | 1285.92 |
| Counselor | 1255.84 |
| Voc. administration | 466.72 |
| Custodial personnel | 723.35 |
| Teacher support services | 1141.85 |
| Fringe benefits | 1819.39 |
| School audit | 13.92 |
| Travel | 1624.23 |
| Services | 1146.12 |
| Utilities | |
| Electricity | 499.06 |
| Water | 19.30 |
| Telephone | 132.87 |
| Sewer | 30.13 |
| Gas | 844.31 |
| Fuel | 346.97 |
| Maintenance | |
| Custodial supplies | 55.19 |
| Other | 42.86 |
| Total cost for program | 51322.17 |
| Cost per student | 4276.85 |

Note. Based on 12 seniors enrolled in the program and a total school enrollment of 388

year income was $72,218.40. Table 6 shows the present value of the increased economic benefit of the trade and industrial program for five consecutive years.

As can be noted in Table 6, the first year total income is much higher than the second to fifth years because it has included the earnings from cooperative placement. The total present income column shows the present value of the future economic benefits obtained for five consecutive years from this program.

Table 7 indicates the responses obtained on the noneconomic benefits from the graduates of the trade and industrial program. As can be noted in this table, students enrolled in the trade and industrial program have obtained several noneconomic benefits such as increased knowledge, greater job opportunities, positive work attitude, ability to make better decisions, and greater sense of well being.

Table 8 shows the present value of net profit of the trade and industrial program for five consecutive years. This table shows increases in the present value of net profit on the basis of the the program as well as on a per student basis for five consecutive years. That is, the relative benefits have exceeded the relative costs in the trade and industrial program.

Table 6
Present Value of Increased Economic Benefits of the Trade and Industrial Program for Five Consecutive Years

| Yr | Total annual income | Discount factor | Discounted benefits | Total present benefits |
|---|---|---|---|---|
| 1 | 72218.40 | - | - | 72218.40 |
| 2 | 24944.95 | 0.88 | 21951.55 | 94169.95 |
| 3 | 25693.30 | 0.83 | 21325.44 | 115495.39 |
| 4 | 26464.09 | 0.78 | 20641.99 | 136137.38 |
| 5 | 27258.02 | 0.73 | 19898.35 | 156035.73 |

Note. Based on 10 employed graduates in the program

Table 7
Responses of Graduates on Obtained Noneconomic Benefits for the Trade and Industrial Program

| Noneconomic benefit | Percentage |
|---|---|
| Increased knowledge | 90 |
| High job satisfaction | 20 |
| Improved public speaking ability | 00 |
| Care of child | 00 |
| Improved communication ability | 10 |
| Greater job opportunities | 80 |
| Positive work attitudes | 60 |
| Better citizenship | 30 |
| Ability to make better decisions | 70 |
| Influences on family size | 00 |
| Greater sense of well-being | 50 |

Note. Based on 10 employed respondent

Table 8
Present Value of Net Profit of the Trade and Industrial Program for Five Consecutive Years

| Components | 1 Yr | 2 Yr | 3 Yr | 4 Yr | 5 Yr |
|---|---|---|---|---|---|
| Total benefits | 72218 | 94169 | 115495 | 136137 | 156035 |
| Total costs | 51322 | 51322 | 51322 | 51322 | 51322 |
| Net profit | 20896 | 42847 | 64173 | 84815 | 104713 |
| Per st.benefits | 7221 | 9416 | 11549 | 13613 | 15603 |
| Per stu. costs | 4276 | 4276 | 4276 | 4276 | 4276 |
| Net profit | 2945 | 5140 | 7273 | 9337 | 11327 |

Note. Benefits based on 10 employed graduates, costs are based on 12 students.

## Costs, Benefits, and Net Profit of the Occupational Home Economics Program

An occupational home economics program was one of the vocational programs studied. Seven of nine seniors students enrolled graduated from this program during 1983/84. The program has cooperative placement. In 1983/84, the total enrollment in the area vocational center was 388.

A 71.4% (n=5) response rate was obtained from the mail questionnaire survey of seven graduates of the program. One full-time teacher was employed for this program. The total square footage used in the building for this program was 1,852. The building was built in 1965 with a square footage cost of $11.00. There were no records of building maintenance costs available. Therefore, current replacement cost of buildings was used in building calculation. On a current value basis, $11,404.00 worth of equipment belong to this program. There was no record of maintenance of equipment cost available. To compensate for the nonavailability of maintenance cost of equipment, current value of replacement equipment was used with 10, 15, and 20 years of life expectancies. Table 9 shows the total costs of the occupational home economics program.

The following incomes were considered as economic benefits in the occupational home economics program:

1. Increased earnings from employment of graduates.

Table 9
Costs of the Occupational Home Economics Program for 1983/84

| Cost components | Annual cost |
|---|---|
| Instructional personnel | $25588.75 |
| Building | 1852.00 |
| Equipment | |
| Large | 346.95 |
| Medium | 253.33 |
| Small | 93.50 |
| Materials & supplies | |
| Textbook | 500.00 |
| Other consumable | 47.50 |
| Administration | |
| Principals | 1156.05 |
| Secretaries | 750.12 |
| Counselor | 732.57 |
| Voc. administration | 272.25 |
| Custodial personnel | 421.95 |
| Teacher support services | 666.08 |
| Fringe benefits | 1048.40 |
| School audit | 8.12 |
| Travel | 1464.23 |
| Services | 668.57 |
| Utilities | |
| Electricity | 291.12 |
| Water | 11.25 |
| Telephone | 77.50 |
| Sewer | 17.57 |
| Gas | 492.51 |
| Fuel | 202.39 |
| Maintenance | |
| Custodial supplies | 32.19 |
| Other | 24.99 |
| Total cost for program | 37019.89 |
| Cost per student | 5288.55 |

Note. Based on seven seniors enrolled and a total school enrollment of 388.

2. Earnings from cooperative placement of students while in school.
3. Earning from the provision of services for the general public.

According to the survey, a 40% employment rate was obtained for the respondents. The remaining graduates were full time housewives. The average number of hours worked per week by the graduates of this program was 27.5. The total monthly income of working graduates was $980.00 with an annual income of $11,760.00. The comparable monthly income on the basis of the minimum wage was calculated as $737.00 with an annual income of $8,844.00. Thus, the annual increased income was $2,916.00. The earnings from cooperative placement was $4,592.72. Earnings from provision of services to the public was $159.12. The total first year income was $7,667.84.

Table 10 shows the present value of the increased economic benefit of the occupational home economics program for five consecutive years. As can be noted in table 10, the first year total income is much higher than the second to fifth years because it has included both the earnings from cooperative placement and the provision of services. The total present income column shows the present value of future economic benefits obtained from the occupational home economics program for five consecutive years.

Table 10
Present Value of Increased Economic Benefits of the Occupational Home Economics Program for Five Consecutive Years

| Yr | Total annual income | Discount factor | Discounted benefits | Total present income |
|---|---|---|---|---|
| 1 | 7667.84 | - | - | 7667.84 |
| 2 | 3003.48 | 0.88 | 2643.06 | 10310.90 |
| 3 | 3093.58 | 0.83 | 2567.67 | 12878.57 |
| 4 | 3186.39 | 0.78 | 2485.38 | 15363.95 |
| 5 | 3281.98 | 0.73 | 2395.85 | 17759.80 |

Note. Based on two employed graduates

Table 11 indicates the responses obtained on the noneconomic benefits from the graduates of the occupational home economics program. As can be noted in this table, students enrolled in the occupational home economics program have obtained several noneconomic benefits such as high job satisfaction, care of child, positive work attitude, and greater sense of well being.

Table 12 shows the present value of net profit/loss of the occupational home economics program for five consecutive years. This table shows the present value as a net loss on the basis of the program and net loss on a per student basis for the first to second year and net profit from the third to fifth year. The change from net loss to net profit on a per student basis occurred because after the third year the increased earnings obtained by a graduate exceeds the incurred costs. However, the total costs exceed the benefits in the occupational home economics program.

## Costs, Benefits, and Net Profit of the Business Education Program

A business education program was one of the vocational programs studied. All 10 seniors enrolled graduated from this program during 1983/84. It is a cooperative program. In 1983/84, the total enrollment in the business education service area of the school was 363. The total enrollment in the high school was 1,043. A 90% (n=9) return rate was obtained from the survey of 10 graduates of this program.

Table 11
Responses of Graduates on Obtained Noneconomic Benefits of the Occupational Home Economics Program

| Noneconomic benefit | Percentage |
|---|---|
| Increased knowledge | 40 |
| High job satisfaction | 60 |
| Improved public speaking ability | 00 |
| Care of child | 60 |
| Improved communication ability | 40 |
| Greater job opportunities | 20 |
| Positive work attitudes | 60 |
| Better citizenship | 40 |
| Ability to make better decisions | 40 |
| Influences on family size | 40 |
| Greater sense of well-being | 60 |

Note. Based on the five graduates.

Table 12
Present Value of Net Profit of the Occupational Home Economics Program for Five Consecutive Years

| Components (in absolute dollars) | 1 Yr | 2 Yr | 3 Yr | 4 Yr | 5 Yr |
|---|---|---|---|---|---|
| Total benefits | 7667 | 10310 | 12878 | 15363 | 17759 |
| Total costs | 37019 | 37019 | 37019 | 37019 | 37019 |
| Net loss | 29352 | 26709 | 24141 | 21656 | 19260 |
| Per st.benefits | 3833 | 5155 | 6439 | 7681 | 8879 |
| Per stu. costs | 5288 | 5288 | 5288 | 5288 | 5288 |
| Net profit/loss | -1455 | -133 | 1251 | 2393 | 3591 |

Note. Benefits based on two employed graduates, costs are based on seven students

Sixty percent of one instructor's time was used to teach in this program. Thus, 60% of that teacher's salary was prorated to this program. The total square footage used in the building for the program was 1,200. The building was constructed in 1971 at a square footage cost of $16.30. There were no records of building maintenance costs available. Therefore, current replacement cost of building was used in building calculation. On a current value basis, $62,150.00 worth of equipment belong to this program. There were no records of equipment maintenance cost available. To compensate for the nonavailability of maintenance cost of equipment, current value of replacement equipment was used with 5 and 10 years of life expectancies. Table 13 shows the total costs of the business education program.

The following incomes were considered as economic benefits in the business education program:

1. Increased earnings from employment of graduates.
2. Earnings from cooperative placement.

According to the survey, 100% employment rate was obtained for the respondents. The average number of hours worked per week by the business education program graduates was 36.0. The total monthly income of all graduates was $5,678.00 with an annual income of $68,136.00. The comparable monthly income on the basis of the minimum wage was calculated as $4,341.60 with an annual income of $52,099.20. Thus, the increased annual income was

Table 13
Costs of the Business Education Program for 1983/84

| Cost components | Annual cost |
|---|---|
| Instructional personnel | $17213.63 |
| Building | 1200.00 |
| Equipment | |
| Large | - |
| Medium | 43.04 |
| Small | 256.34 |
| Materials & supplies | |
| Textbook | 52.43 |
| Other consumable | 470.00 |
| Administration | |
| Principals | 903.94 |
| Secretaries | 525.72 |
| Counselor | 274.77 |
| Voc. administration | 113.12 |
| Custodial personnel | 740.93 |
| Teacher support services | 516.97 |
| Fringe benefits | 762.54 |
| School audit | 6.74 |
| Travel | 277.68 |
| Services | 981.02 |
| Utilities | |
| Electricity | 585.67 |
| Water | 27.17 |
| Telephone | 38.07 |
| Sewer | 29.77 |
| Gas | 306.45 |
| Fuel | - |
| Maintenance | |
| Custodial supplies | 45.99 |
| Other | 35.71 |
| Total cost for program | 25407.70 |
| Cost per student | 2540.77 |

Note. Based 10 enrolled seniors.

$16,036.80. The earnings from cooperative placement was $41,077.75. The total first year income was $57,114.55.

Table 14 shows the present value of increased benefits of the business education program for five consecutive years. As can be noted in the table, the first year total income is higher than the second to fifth years because it has included the earnings from cooperative placement.

Table 15 indicates the responses obtained on the noneconomic benefits from graduates of the business education program. As can be noted in the table, students enrolled in the business education program have obtained several noneconomic benefits such as increased knowledge, high job satisfaction, improved public speaking ability, improved communication ability, greater job opportunities, positive work attitudes, ability to make better decisions, and greater sense of well being.

Table 16 shows the present value of net profit of the business education program for five consecutive years. This table also shows net profit on a per student basis for five consecutive years. This analysis shows that relative benefits have exceeded the relative costs in the business education program.

Table 14
Present Value of the Increased Economic Benefits of the Business Education Program for Five Consecutive Years

| Yr | Total annual income | Discount factor | Discounted benefits | Total present income |
|---|---|---|---|---|
| 1 | 57114.55 | - | - | 57114.55 |
| 2 | 16517.90 | 0.88 | 14535.75 | 71650.30 |
| 3 | 17013.44 | 0.83 | 14121.15 | 85771.45 |
| 4 | 17523.84 | 0.78 | 13668.59 | 99440.04 |
| 5 | 18049.56 | 0.73 | 13176.17 | 112616.21 |

Note. Based on nine employed graduates

Table 15
Responses of Graduates on Obtained Noneconomic Benefits of the Business Education Program

| Noneconomic benefit | Percentage |
|---|---|
| Increased knowledge | 87.5 |
| High job satisfaction | 62.5 |
| Improved public speaking ability | 50.0 |
| Care of child | 00.0 |
| Improved communication ability | 62.5 |
| Greater job opportunities | 75.0 |
| Positive work attitudes | 75.0 |
| Better citizenship | 25.0 |
| Ability to make better decisions | 50.0 |
| Influences on family size | 00.0 |
| Greater sense of well-being | 50.0 |

Note. Based on nine respondents

Table 16
Present Value of Net profit of The Business Education Program for Five Consecutive Years

| Components | 1 Yr | 2 Yr | 3 Yr | 4 Yr | 5 Yr |
|---|---|---|---|---|---|
| Total benefits | 57114 | 71650 | 85771 | 99440 | 112616 |
| Total costs | 25407 | 25407 | 25407 | 25407 | 25407 |
| Net profit | 31707 | 46243 | 60364 | 74033 | 87209 |
| Per st.benefits | 6346 | 7961 | 9530 | 11048 | 12512 |
| Per stu. costs | 2540 | 2540 | 2540 | 2540 | 2540 |
| Net profit | 3806 | 5421 | 6990 | 8508 | 9972 |

Note. Benefits based on nine employed graduates, costs are based on 10 students

## Costs, Benefits, and Net Profit of the Marketing and Distributive Education Program

A marketing and distributive education program was one of the vocational programs studied. All 17 seniors enrolled graduated from this program during 1983/84. It is a program that utilizes cooperative placement. In 1983/84, the total enrollment in the service area of the school was 145. The total enrollment in the high school was 1043. Fourteen of the 17 graduates surveyed responded for a response rate of 82.3%.

Sixty percent of one instructor's time was used to teach this program. Thus, 60% of the instructor's salary was prorated to this program. The total square footage used in the building for this program was 650. The building was constructed in 1971 at a square footage cost of $16.30. There were no records of building maintenance costs available. Therefore, current replacement cost of buildings was used in the building calculation. On a current value basis, $8,996.00 worth of equipment belong to this program. There were no records of equipment maintenance cost available. To compensate for the nonavailability of maintenance cost of equipment, the current value of replacement equipment was used with 5 and 10 years of life expectancies. Table 17 shows the total cost of the marketing and distributive education program.

Table 17
Costs of the Marketing and Distributive Education Program for 1983/84

| Cost components | Annual cost |
|---|---|
| Instructional personnel | $12645.00 |
| Building | 650.00 |
| Equipment | |
| Large | - |
| Medium | 93.03 |
| Small | 24.88 |
| Materials & supplies | |
| Textbook | 460.12 |
| Other consumable | 1273.00 |
| Administration | |
| Principals | 1536.71 |
| Secretaries | 893.73 |
| Counselor | 467.12 |
| Voc. administration | 192.31 |
| Custodial personnel | 1259.60 |
| Teacher support services | 878.85 |
| Fringe benefits | 1296.33 |
| School audit | 11.45 |
| Travel | 607.00 |
| Services | 1667.73 |
| Utilities | |
| Electricity | 995.65 |
| Water | 46.19 |
| Telephone | 64.73 |
| Sewer | 50.61 |
| Gas | 520.96 |
| Fuel | - |
| Maintenance | |
| Custodial supplies | 78.18 |
| Other | 60.71 |
| Total cost for program | 25773.89 |
| Cost per student | 1516.11 |

Note. Based on 17 seniors

The following incomes were considered as economic benefits in the marketing and distributive education program.

1. Increased earnings from employment of graduates.
2. Earnings from cooperative placement.

According to the survey, 100% employment rate was obtained for the respondents. The average number of hours worked per week by the graduates of this program was 38.1. The total monthly income of all graduates was $8,415.00 with an annual income of $100,980.00. The comparable monthly income on the basis of the minimum wage was calculated as $7,147.56 with an annual income of $85,770.72. Thus, the increased annual income was $15,209.28. The earning from the cooperative placement was $58,544.00. Finally, the total first year income was $73,753.28.

Table 18 shows the present value of increased economic benefit of the marketing and distributive education program for five consecutive years. As can be noted in the table, the first year total income is higher than the second to fifth years because it has included the earnings from cooperative placement.

Table 19 indicates the responses obtained on the noneconomic benefits from the graduates of the marketing and distributive education program. As can be noted in the table, students enrolled in the marketing and distributive education program have obtained several noneconomic benefits

Table 18
Present Value of Increased Benefits of the Marketing and Distributive Education Program for Five Consecutive Years

| Yr | Total annual income | Discount factor | Discounted benefits | Total present income |
|---|---|---|---|---|
| 1 | 73753.28 | - | - | 73753.28 |
| 2 | 15665.55 | 0.88 | 13785.68 | 87538.96 |
| 3 | 16135.52 | 0.83 | 13392.48 | 100931.44 |
| 4 | 16619.58 | 0.78 | 12963.27 | 113894.71 |
| 5 | 17118.17 | 0.73 | 12496.26 | 126390.97 |

Note. Based on 14 employed graduates

Table 19
Responses of Graduates on Obtained Noneconomic Benefits of the Marketing and Distributive Education Program

| Noneconomic benefit | Percentage |
|---|---|
| Increased knowledge | 100 |
| High job satisfaction | 50 |
| Improved public speaking ability | 40 |
| Care of child | 00 |
| Improved communication ability | 80 |
| Greater job opportunities | 70 |
| Positive work attitudes | 90 |
| Better citizenship | 40 |
| Ability to make better decisions | 50 |
| Influences on family size | 00 |
| Greater sense of well-being | 70 |

Note. Based on 10 respondents

such as increased knowledge, high job satisfaction, improved communication ability, greater job opportunities, positive work attitudes, ability to make better decisions, and a greater sense of well being.

Table 20 shows the present value of the increased economic benefits of the marketing and distributive education program for five consecutive years. This table shows increases in the present value of net profit on the basis of the total program as well as on a per student basis from the first year through the fifth year. This indicates that relative benefits have exceeded the relative costs in the marketing and distributive education program.

Useability and Transportability

Useability was considered the extent to which the cost-benefit analysis model was practical enough to be used by vocational administrators at the local level. Transportability was the extent to which the cost-benefit analysis model was feasible for use in vocational education settings other than where it was field tested. The panel of experts opinions were used to determine both the useability and transportability of the model. The members of the panel of experts unanimously determined that the model was useable and transportable to other secondary vocational settings.

Table 20
Present Value of Net Profit of the Marketing and Distributive Education Program for Five Consecutive Years

| Components | 1 Yr | 2 Yr | 3 Yr | 4 Yr | 5 Yr |
|---|---|---|---|---|---|
| Total benefits | 73753 | 87538 | 100931 | 113894 | 126390 |
| Total costs | 25773 | 25773 | 25773 | 25773 | 25773 |
| Net profit | 47980 | 61765 | 75158 | 88121 | 100617 |
| Per st.benefits | 5268 | 6252 | 7209 | 8135 | 9207 |
| Per stu. costs | 1516 | 1516 | 1516 | 1516 | 1516 |
| Net profit | 3752 | 4736 | 5693 | 6619 | 7511 |

Note. Benefits based on 14 employed graduates, costs are based on 17 students

## Summary of Chapter Findings

The cost-benefit analysis model was field tested in four selected service area programs namely trade and industrial (T&I), occupational home economics (OHE), business education (BUS), and marketing and distributive education (MD). Table 21 shows the total costs for 1983/84 of all four programs.

Table 22 shows the present value of net profit that could be obtained from each of the four programs for five consecutive years. The relative benefits have exceeded the relative costs in three programs of the study.

Students enrolled in all four field tested programs have obtained several noneconomic benefits. Table 23 shows these noneconomic benefits obtained for all four programs.

Table 21
Summary Costs of Four Vocational Programs For 1983/84

| Cost components | Annual costs T & I (n=12) | OHE (n=7) | BUS (n=10) | MD (n=17) |
|---|---|---|---|---|
| Ins.personnel cost | $29314 | $25588 | $17213 | $12645 |
| Building | 2583 | 1852 | 1200 | 650 |
| Equipment | | | | |
| Large | 2886 | 346 | - | - |
| Medium | 1281 | 253 | 43 | 93 |
| Small | 300 | 93 | 256 | 24 |
| Matel & supplies | | | | |
| Textbooks | 331 | 500 | 52 | 460 |
| Consumable | 1194 | 47 | 470 | 1273 |
| Administration | | | | |
| Principal | 1981 | 1156 | 903 | 1536 |
| Secretaries | 1285 | 750 | 525 | 893 |
| Counselor | 1255 | 732 | 274 | 467 |
| Voc. admin | 466 | 272 | 113 | 192 |
| Custodial | 723 | 421 | 740 | 1259 |
| Teacher support | 1141 | 666 | 516 | 878 |
| Fringe benefits | 1819 | 1048 | 762 | 1296 |
| Sch. audit | 13 | 8 | 6 | 11 |
| Travel | 1624 | 1464 | 277 | 607 |
| services | 1146 | 668 | 981 | 1667 |
| Utilities | | | | |
| Electricity | 499 | 291 | 585 | 995 |
| water | 19 | 11 | 27 | 46 |
| Telephone | 132 | 77 | 38 | 64 |
| Sewer | 30 | 17 | 29 | 50 |
| Gas | 844 | 492 | 306 | 520 |
| Fuel | 346 | 202 | - | - |
| Maintenance | | | | |
| Cus.supplies | 42 | 24 | 45 | 78 |
| Other | 55 | 32 | 35 | 60 |
| Total cost for prm. | 51322 | 37019 | 25407 | 25773 |
| Cost per student | 4276 | 5288 | 2540 | 1516 |

Table 22
Present Value of Net Profit of Four Vocational Programs Based on Employed Graduates

| Prm | Yr | Pre. value of benefits | Total costs | Net Profit (program) | Net Profit (student) |
|---|---|---|---|---|---|
| T | 1 | 72218 | 51322 | 20896 | 2945 |
| & | 2 | 94169 | 51322 | 42847 | 5140 |
| I | 3 | 115495 | 51322 | 64173 | 7273 |
| (n=10) | 4 | 136137 | 51322 | 84815 | 9337 |
| | 5 | 156035 | 51322 | 104713 | 11327 |
| O | 1 | 7667 | 37019 | (29352) | (1455) |
| H | 2 | 10310 | 37019 | (26709) | (133) |
| E | 3 | 12878 | 37019 | (24141) | 1251 |
| (n=2) | 4 | 15363 | 37019 | (21656) | 2393 |
| | 5 | 17759 | 37019 | (19260) | 3591 |
| B | 1 | 57114 | 25407 | 31707 | 3806 |
| U | 2 | 71650 | 25407 | 46243 | 5421 |
| S | 3 | 85771 | 25407 | 60364 | 6990 |
| (n=9) | 4 | 99440 | 25407 | 74033 | 8508 |
| | 5 | 112616 | 25407 | 87209 | 9972 |
| M | 1 | 73753 | 25773 | 47980 | 3752 |
| D | 2 | 87538 | 25773 | 61765 | 4736 |
| (n=14) | 3 | 100931 | 25773 | 75158 | 5693 |
| | 4 | 113894 | 25773 | 88121 | 6619 |
| | 5 | 126390 | 25773 | 100617 | 7511 |

Table 23
Percentage Who Obtained Noneconomic Benefits of Four Vocational Programs

| Noneconomic benefits | T & I (n=10) | OHE (n=5) | BUS (n=9) | MD (n=10) |
|---|---|---|---|---|
| Inc. knowledge | 90 | 40 | 87.5 | 100 |
| Hig.job satisfaction | 20 | 60 | 62.5 | 50 |
| Imp.pub.speaking | 00 | 00 | 50.0 | 40 |
| Care of child | 00 | 60 | 00.0 | 00 |
| Imp comm.ability | 10 | 40 | 62.5 | 80 |
| Greater job oppot. | 80 | 20 | 75.0 | 70 |
| Pos.work attitude | 60 | 60 | 75.0 | 90 |
| Bett.citizenship | 30 | 40 | 25.0 | 40 |
| Better ability | 70 | 40 | 50.0 | 50 |
| Inf.on family size | 00 | 40 | 00.0 | 00 |
| Sense of well being | 50 | 60 | 50.0 | 70 |

# CHAPTER 5

## SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND DISCUSSION

Vocational education has become a focal point for legislators, educators, parents, taxpayers, students, and others in the public education sector. The new vocational education act, the Carl D. Perkins Vocational Education Act, encourages state and local governments to expand, improve, modernize, and develop high quality vocational education programs. Accordingly, state and local governments have to be more efficient and responsive in terms of costs and benefits. That is, costs and benefits of vocational education programs must be examined at the local level. An important procedure to be used to examine the costs and benefits is cost-benefit analysis. The primary purpose of this study was to propose and field test a cost-benefit analysis model.

### Summary

#### The Problem

Vocational education was an immediate target for Federal budget cuts in January 1981. As a result of this, vocational education in many states is already under fiscal

pressures. Thus, a major challenge confronting vocational education is to justify its programs in economic terms. There is a mounting criticism regarding the accountability of vocational education. The most important part of this criticism is that accountability in vocational education has been primarily based on inputs, staff activities, and participant's information. Evidently, there is a need to relate inputs and outputs in terms of dollars. While there are some cost-benefit studies of vocational education, generally they have been completed by economists or educators with major help from economists. Such studies were large scale attempts in nature and generally conducted for policy making at a higher level. No studies could be identified which were conducted only from the school's point of view and at the single program level within a service area. Thus, there is an absence of a practical evaluation technique which considers both costs and benefits to determine the profitability of secondary vocational education programs at the local level.

## Purpose of this Study

The purpose of this study was to propose and field test a cost-benefit analysis model to determine the profitability of secondary vocational programs at the local level. Specifically, the objectives of this study were to:

1. Propose a cost-benefit analysis model to determine the profitability of secondary vocational education.
2. Field test the model to determine its useability.
3. Gather feedback information on transportability of the model based on the field testing.
4. Make recommendations on the use of the cost-benefit analysis model for secondary vocational education.

## Research Questions

The research questions answered in this study were:

1. What are the specific components of the cost-benefit analysis model used to determine the profitability of secondary vocational education?
2. How effectively can costs and benefits of secondary vocational education be calculated?
3. How effective is the cost-benefit analysis model as an evaluation technique for secondary vocational education?

## Significance of the Study

Legislative bodies have increased requirements for accountability and created a competitive situation for the limited number of dollars with other educational agencies. It has become important not only to measure inputs but also to measure outputs of vocational education programs. Thus, it is crucial to have a technique which facilitates

comparison of costs and benefits. The developed cost-benefit analysis model could be a milestone for credible accountability of vocational education. Further, analyzing both economic and noneconomic benefits through the model could be a very useful concept to convince local communities as a whole and plead for strong support for vocational education. The developed cost-benefit analysis model could be useful for administrators to determine how much profit there is in having a vocational education program. Further, the model could be used by policy-makers at the local level to revise and improve the quality of vocational education. Finally, this model may be a start in the new direction of greater accountability and it could be an effective decision making tool in vocational education at the local level.

Methodology

The methodology for field testing a cost-benefit analysis model of secondary vocational education consisted of the following procedures:

1. Propose a cost-benefit analysis model for a secondary vocational education program.
2. Seek the opinion of a panel of experts relating to needed revision in the cost-benefit analysis model.
3. Field test the revised model to determine its feasibility.

4. Evaluate the cost-benefit analysis model.
5. Determine the transportability of the cost-benefit analysis model to other secondary vocational education settings.

The model consisted of inputs, process, and outcomes. The cost component of the model included cost items such as instructional personnel, building, equipment, materials and supplies, administration, travel, utilities, maintenance, and services. The benefits component consisted of economic earnings such as increased earning from graduate's employment, earnings from cooperative placement, and earnings from provision of services; and noneconomic earnings such as increased knowledge, job opportunities, and job seeking skills.

Panel of experts' opinions and suggestions were used to refine and revise the cost-benefit analysis model. The revised cost-benefit analysis model was field tested. A comprehensive high school and an area vocational center were purposively selected for this study in the Roanoke County School Division, Virginia. The business education and marketing and distributive education programs from a comprehensive high school, and occupational home economics and trade and industrial programs from an area vocational center were purposively selected with the help of the vocational director for the school division.

Data Collection

Four visits were made by the researcher to the school division's central administrative office and to the school sites to gather data related to costs and benefits. Further, a follow-up survey was conducted to determine the monthly income earned and average number of hours worked per week by the graduates in each program. A graduate questionnaire used by the Roanoke County School Division was modified and used for the follow-up survey. Because all 46 graduates in all four programs were considered for the study, sampling was not used. There was a 73.9% return obtained from the survey.

Calculation of Costs

Instructional personnel cost was prorated based on the percentage of instructional time spent in the specific program. Annual building space cost used for the program was prorated based on the current replacement square footage cost of school buildings in Virginia with an anticipated life expectancy of 50 years. Current value of equipment owned for each program was used to prorate the equipment cost. A lifespan of 5 to 20 years was selected, depending upon the size and cost of of equipment to calculate its annual costs. Costs incurred in the 1983/84 fiscal year for materials and supplies and travel were considered as 100% vocational costs in the model. Administration, utilities,

services, and maintenance costs of fiscal year 1983/84 were prorated for each program by using the proportion of students enrolled in a program compared to the total enrollment in the respective school. The total costs were not discounted because all the program costs were considered to have occurred in one year.

Calculation of Benefits

Increased income of vocational graduates was determined by subtracting the Federal minimum wage of $3.35 per hour from the graduates' earnings per hour and multiplying by the average number of hours worked. Present value of increased income was determined after adjusting for 3% annual salary increases for the second through fifth years. Income earned from cooperative placement and provision of services were added to the first year income. The benefits of the second through fifth years valued in monetary terms were summed and discounted to the present value by a discount factor determined on the basis of 6.5% interest rate.

Useability and Transportability

Useability and transportability of the cost-benefit analysis model were determined based on the panel of experts' opinions and suggestions during this study. The panel of experts was contacted twice. The first time an outline of the model was shared. The second time findings of the study were shared.

## Findings

Trade and industrial, business education, and marketing and distributive education programs all indicated greater economic benefits than costs. The occupational home economics program showed greater costs than economic benefits. Students enrolled in all four programs obtained several noneconomic benefits through those programs.

## Conclusions

Based upon the findings of the study the following conclusions were made:

1. The proposed cost-benefit analysis model is useable.
2. The cost-benefit analysis model is transportable to other secondary vocational settings.

In the specific field test site used for this study it was concluded that:

1. The trade and industrial program was economically profitable.
2. The occupational home economics program was not economically profitable.
3. The business education program was economically profitable.
4. The marketing and distributive education program was economically profitable.
5. Graduates in each program have obtained several noneconomic benefits.

## Recommendations

Based on the findings and conclusions of this study, the following recommendations were made:

1. That local vocational administrative units use the concept of cost-benefit analysis as an evaluation technique for secondary vocational education programs.
2. That a research study be conducted to determine what other costs and benefits should be considered in the cost-benefit analysis model.
3. That a research study be conducted to determine the economic value of noneconomic benefits.
4. That a longitudinal cost-benefit analysis be made to determine economic earnings and types of jobs held by students after their graduation.
5. A study should be conducted using cost-benefit analysis with an appropriate comparison group to vocational graduates.
6. That an annual cost-benefit analysis of vocational programs be conducted for each school system to make comparative judgement of their programs.
7. That post secondary vocational programs explore the possibility of using cost-benefit analysis for evaluating their programs.

## Discussion

The field testing of the cost-benefit analysis model of secondary vocational education programs and its findings and conclusions suggest that the proposed model could be used to determine the profitability of the programs and is transportable to other secondary vocational education settings. Obviously, the model has helped to determine the net profit or loss of programs and eventually to differentiate the profitable and nonprofitable programs from the point of view of the school. Accordingly, the researcher argues that the proposed model has accomplished what it was intended to do. The success in field testing the model at the secondary level has lead the researcher to recommend that the model be used to justify the vocational education programs at the secondary level.

Low employment rates, lack of opportunities to earn income during cooperative placement, and a tendency to not be economically employed were reasons for the finding of nonprofitability of the occupational home economics program. Therefore, researchers must be cognizant of all related factors while using cost-benefit analysis. It is not enough to simply examine net profit in making policy decisions about programs.

There are variations in the process of implementing vocational programs from one settings to another. Thus, the specific proration and calculation procedures used in this

study may or may not be directly adoptable and acceptable to other vocational education settings. However, the researcher believes that the basis on which the costs and benefits were prorated could be a useful guide for using the concept of cost-benefit analysis as an evaluation technique in vocational education.

Present values of future increased benefits were determined for five consecutive years based using first year increased income as a factor. Although using increased income could be a debatable approach, there is no reasonable alternative method available to determine the actual benefits of the vocational program for this model. In this study, the Federal minimum wage of $3.35 per hour was used as a basis to determine the increased benefits attributable to vocational education programs. Any income earned more than the minimum wage was considered as the income obtained as a result of the enrollment in the vocational education program. Although income of comparable nonvocational graduates' could be used to determine the increased income, feasibility of its use exists in the problem of identifying and using an appropriate comparison group. There may be another debate that even the increased income is not totally attributable to vocational education. In fact it is more than the contribution of vocational education. However, vocational educators have the right to claim the increased income until a comprehensive research study accurately portions the benefits to all causes.

Analysis of noneconomic benefits are very subjective but they are important in analyzing the benefits of vocational programs. It is impossible to judge them objectively or value them in terms of dollars and cents. Further research should investigate noneconomic benefits to determine if it is feasible to value them in terms of equivalent dollars and cents.

Finally, it is difficult to propose and use a unified cost-benefit analysis model which is acceptable to everyone in vocational education. Although it has been demonstrated that it could be used as well as determined to be transportable to other secondary vocational settings, further research must be conducted to make appropriate changes in the model depending on the intended purpose. Until clear and verifiable research is made, this model could be used to determine the profitability of vocational programs. Moreover, the author strongly believes that the cost-benefit analysis model will lead researchers in a new direction towards the application of cost-benefit analysis as an evaluation technique for secondary vocational education programs.

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# Appendix A

## MODIFIED GRADUATE FOLLOW-UP QUESTIONNAIRE USED BY ROANOKE COUNTY SCHOOL DIVISION, VIRGINIA.

ROANOKE COUNTY PUBLIC SCHOOLS
VOCATIONAL AND ADULT EDUCATION DEPARTMENT
FOLLOW-UP SURVEY

Your responses will be treated confidentially. Only totals and percents will be reported. This information will help our school to improve the quality of its Vocational Education program.

1. School (Please check) ___CSHS ___GHS ___NHS ___WBHS ___ARBVTS ___RCOS

2. Area of vocational training: ___Business ___Marketing & Distributive Education
___Child Care ___Trade & Industrial ___Horticulture ___Health Related

3. Name_____

4. Address_____

5. Telephone Number_____ Social Security Number_____

6. What were your post-graduation plans while still a senior in high school? (Check no more than two)

___a. To get a full-time job immediately
___b. To go to college
___c. To attend business or vocational school
___d. To enter the Armed Services
___e. No definite plans
___f. Other_____

7. What did you do during the first year following your graduation from high school?

___a. Was steadily employed full-time for more than six months
___b. Was unemployed for more than six months
___c. Attended college for a school year
___d. Started to college but dropped out before the end of the school year
___e. Entered the Armed Services
___f. Attended a business or vocational school
___g. Apprenticeship
___h. Other_____

8. What are you doing now? (Check no more than two)

___a. Unemployed, seeking work
___b. Unemployed, not seeking work
___c. Employed full-time (at least 30 hrs/wk)
___d. Employed part-time (less than 30 hrs/wk)
___e. Full-time homemaker
___f. Full-time student
___g. Part-time student
___h. In the Armed Services
___i. Other_____

9. If you are working, (either full time or part time), on what basis is your pay figured? Please check hourly, weekly, or monthly.

___Hourly wage rate
___Weekly salary
___Monthly salary

Indicate your gross pay appropriate for either the hourly, weekly, or monthly rate checked.

$_____.____

How many hours, on the average, per week do you work? _____

10. Is your present job related to your field of Vocational Education training?

___a. Yes, it is directly or closely related.
___b. No, it is only remotely related or is not related.

11. What are your long-range plans? (Check only one or two)

___a. Expect to continue in my present work
___b. Plan to get more education
___c. Do not plan for any other education
___d. Hope to change my job
___e. Uncertain
___f. Other_____

- OVER -

12. When did you decide definitely on your life's work?

___a. Before ninth grade
___b. In ninth or tenth grade
___c. In eleventh or twelfth grade
___d. Since high school graduation
___e. While on present job
___f. In college
___g. Still undecided
___h. Other_____

13. How much post-high school, college, business, vocational, or employer-sponsored training have you received?

___a. None
___b. Less than six months
___c. Between six months and one year
___d. One year, but less than two
___e. Two years, but less than three
___f. Three years

14. How would you rate yourself as a high school student?

___a. Above Average ___b. Average ___c. Below Average

15. If the vocational training program in which you took the most courses was not available, what would you have done for your education? Please check one.

___a. Become a school dropout
___b. Pursued another curriculum (Name curriculum)_____
___c. Other_____

16. What subjects, activities, or services which you did not receive or participate in while in high school would have helped you more in your life or work since graduation?

_____

_____

17. Was your vocational training satisfactory? ___Yes ___No
If "no", explain. _____

_____

18. Please check each of the non-financial benefits you obtained from your vocational training program?

___a. Increased knowledge
___b. High job satisfaction
___c. Improved public speaking ability
___d. Care of child
___e. Improved communication ability
___f. Greater job opportunities
___g. Positive work attitude
___h. Better citizenship
___i. Ability to make better
___j. Influences on family size
___k. Greater sense of well being
___l. Other (specify)_____

EVALUATE YOUR SCHOOL AS YOU NOW SEE IT IN RELATION TO THE FOLLOWING COURSES, SKILLS, AND SERVICES.

| | Excellent | Good | Poor | Unable To Rate |
|---|---|---|---|---|
| Home Economics | | | | |
| Business Courses | | | | |
| Cooperative Office Education | | | | |
| Marketing and Distributive Education | | | | |
| Industrial Arts | | | | |
| Vocational Training--Southview Career Center | | | | |
| Vocational Training--Roanoke County Occupational School | | | | |
| Vocational Training--Arnold R. Burton Voc Tech | | | | |
| Job Seeking Skills | | | | |

# Appendix B

## INITIAL COVER LETTERS FOR INSTRUMENT SIGNED BY TEACHERS IN ALL FOUR PROGRAMS.

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

*Blacksburg, Virginia* 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

Dear Graduate:

Please accept this letter as a personal request from both my program and the Vocational Technical Division at Virginia Tech. We are participating in a study which examines our vocational program and the opinions' graduates have of it.

Our hope, is to find out what our graduates are doing. We also hope to find ways for improving our program. The information you share with us will help do both. Let me assure you, that the information you share will be kept confidential and your name will not be mentioned in any reports.

Please take a few minutes and complete the enclosed questionnaire as completely and as accurately as possible. Place the questionnaire in the enclosed, self-addressed, and postage paid envelope. The questionnaire will be analyzed at Virginia Tech where it will be part of a doctoral research study.

I sincerely appreciate your help.

Yours truly,

Teacher
Marketing Education Department
William Byrd High School

P.S. Be certain to enjoy a piece of BIG RED shewing gum while you complete the questionnaire. Please return it by February 10 after completing both sides.

cfp

Enclosure

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

*Blacksburg, Virginia* 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

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I sincerely appreciate your help.

Yours truly,

Teacher
Machine Shop
Arnold Burton Vocational
Technical School

P.S. Be certain to enjoy a piece of BIG RED chewing gum while you complete the questionnaire. Please return it by February 10 after completing both sides.

cfp

Enclosure

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

*Blacksburg, Virginia* 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

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I sincerely appreciate your help.

Yours truly,

Teacher
Business Department
William Byrd High School

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cfp

Enclosure

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I sincerely appreciate your help.

Yours truly,

Teacher
Home Economics Department
Arnold Burton Vocational
Technical School

cfp

Enclosure

P.S. Be certain to enjoy a piece of BIG RED chewing gum while you complete the questionnaire. Please return it by February 10 after completing both sides.

# Appendix C

## FOLLOW-UP POSTCARD REMINDER

Dear Graduate:

You were recently sent a questionnaire.surveying your feelings about the vocational program you pursued while in high school. Roanoke County School Division is participating in a study with Virginia Tech which will provide valuable feedback to vocational education for both the Division and Tech. Your response is most important. If you have already completed the questionnaire, thank you. If you have not had a chance to, please take a few minutes and complete it as soon as possible.

Thank You

# Appendix D

## SECOND COVER LETTERS FOR INSTRUMENT SIGNED BY TEACHERS IN ALL FOUR PROGRAMS.

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

*Blacksburg, Virginia* 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

Dear Graduate:

A short time ago, you were mailed a questionnaire to find out what our graduates are doing and to find out ways for improving our vocational program. We need your help on both.

It is very important that we receive a completed questionnaire from you. Please complete both sides of the questionnaire and place it in the enclosed, self-addressed, and postage paid envelope.

Please return the questionnaire since it will be of value in promoting more quality vocational programs throughout Roanoke County.

Thank you for your time and valuable information.

Sincerely yours,

Teacher
Marketing Education Department
William Byrd High School

cfp

Enclosure

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

*Blacksburg, Virginia* 24061

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Thank you for your time and valuable information.

Sincerely yours,

Teacher
Machine Shop
Arnold Burton Vocational
Technical School

cfp

Enclosure

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VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

*Blacksburg, Virginia* 24061

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Dear Graduate:

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Thank you for your time and valuable information.

Sincerely yours,

Teacher
Business Department
William Byrd High School

cfp

Enclosure

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VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

*Blacksburg, Virginia* 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

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Please return the questionnaire since it will be of value in promoting more quality vocational programs throughout Roanoke County.

Thank you for your time and valuable information.

Sincerely yours,

Teacher
Home Economics Department
Arnold Burton Vocational
Technical School

cfp

Enclosure

# Appendix E

## PANEL MEMBERS

PANEL MEMBERS

, Professor, Agricultural Economics, Virginia Tech, Blacksburg, Virginia.

, Vocational Director, Roanoke County School Division, Salem, Virginia.

, Professor, Vocational and Technical Education, Virginia Tech, Blacksburg Virginia.

Mr. George Orr, Executive Director, State Advisory Council On Vocational Education, Blacksburg, Virginia.

## Appendix F

## TERMS AND CONDITIONS OF INFORMATION FOR PERSONNEL ENGAGED IN GRADUATERESEARCH, ROANOKE COUNTY SCHOOLS.

OFFICE OF DIVISION SUPERINTENDENT
ROANOKE COUNTY SCHOOLS

SALEM, VIRGINIA 24153

Information for Personnel Engaged in Graduate Research/Thesis/Dissertations

The following understandings would be in effect for your study.

1. You must have principal's approval.

2. You must have teacher's approval.

3. The names of students, teachers and school would not be identified in the study.

4. The collection of data procedures would not require personnel in the Roanoke County Public School System to detract from regular duties.

5. The study would be in compliance with the provisions of the policy governing the student's official record passed by the Roanoke County School Board on July 24, 1980.

6. The Roanoke County Public School System would be furnished a copy of the completed study.

7. The study would not infringe upon the instructional time of the students.

In addition to the above, the teacher(s) would not be expected to change teaching methodology, procedures, materials, etc., to accommodate the study.

1983

OFFICE OF DIVISION SUPERINTENDENT
ROANOKE COUNTY SCHOOLS
SALEM, VIRGINIA 24153

Procedures for Releasing Test Data to Personnel
Engaged in Graduate Research/Thesis/Dissertations

The confidentiality of Roanoke County students' assessment data must be maintained at all times. Therefore, persons engaged in research studies requesting personal data of Roanoke County students must agree to meeting the following criteria:

I. Obtaining permission from students or parents
Virtually no way exists to protect confidentiality from the researcher, even though codes are supplied. Therefore, it will be necessary that written permission be secured from each parent (in case of a minor), or each individual student if 18 years old or older. This written permission must be supplied to the Supervisor of Testing prior to seeking release of data.

II. Coding of student data
A. The researcher must supply the Supervisor of Testing (if standardized test data is required) with a list of student names and their assigned code numbers.

B. In addition, the researcher must supply the Supervisor of Testing with the data collection forms to be used with only student codes listed.

III. Studies with large sample sizes
Studies involving sample sizes of more than 50 students and/or requiring test scores from more than two subject areas will require the services of a clerk or aide. The Supervisor of Testing will secure the services of such a person (at the rate of $3.35 per hour) to collect the desired data. The fee for the clerk/aide will be paid by the researcher directly to the clerk/aide.

December 1983

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