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ABSTRACT

A pilot study is reported in the development of a cost/benefit analysis model for vocational education programs in community colleges and its application to three programs at the College of Alameda. This model can be used to compare and assess the effectiveness of occupational education programs at the same college or different colleges at the same time or at different times. The model is based on the idea that program costs generate measurable return on investment in terms of income derived from placements of students who have completed the program. It is a generic model that is flexible enough to allow users to develop specific models to suit the particular needs of a particular college or district. The model includes a selection of costs to be assessed and analyzed in terms of program costs and benefits to be derived. The model was applied to the business equipment technology, dental assisting, and diesel mechanics programs at the College of Alameda. Institutional direct and indirect costs were selected for analysis because the model's use was determined to be primarily for the allocations and reallocation of institutional resources. Benefits used were increased earnings to the student who completed the program and was placed in the field for which he was trained. Results indicated that the increased income on entering the field was quite small. Further followup studies should be conducted to determine the extent of salary increases, and students and faculty should be better informed of the starting salaries for various fields. (KM)

COLLEGE OF ALAMEDA
Paul L. Holmes
President

Final Report PROJECT NO. 01-61267-C101-71

Project to Develop a Cost Benefit Model for Vocational Programs at College of Alameda

August, 1972

by Fred E. Ittner

Funding was through Part C Vocational Education Grant 1968 Amended, and by Peralta Junior College District. Mr. Ittner was employed by College of Alameda when he wrote this report; he is now employed by Kern Community College District, Bakersfield College.

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Hopefully, this pilot study in the development of a cost/benefit model for vocational education programs in community colleges and its application to three programs at the College of Alameda will provide the basis for continued studies in the development of measurable outcome objectives which can relate costs of occupational programs to measurable outcome benefits.

I would like to thank the following people for their help as consultants on this project:

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Mr. Roger D. Beam, Director of Occupational Education, Compton College
Mr. Joseph D. Berruezo, Assistant Dean of Instruction, Director of Technical Education, Marin Community College District
Mr. Charles E. Davis, Coordinator of Research and Development, Los Angeles Trade Technical College
Mr. Cecil D. Green, Dean of Occupational Education, Riverside Community College
Mr. Louis G. Trapp, Area Coordinator of Vocational Education, Contra Costa Community College District
Mr. Edwin M. Pearce, Director of Vocational Education, Cuesta College

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INTRODUCTION

A COST/BENEFIT MODEL

FOR OCCUPATIONAL EDUCATION PROGRAMS IN COMMUNITY COLLEGES

1.00 Needs Assessment - Why Cost/Benefit Analysis?

The cost/benefit model presented in this paper offers a flexible adaptable model which can be used to compare and assess the effectiveness of occupational education programs at (1) the same college, (2) different colleges, at the same time or at different times.

In order to determine how cost/benefit analysis can be useful at the community college, it is important to look at <u>what is</u>, in relation to <u>what should be</u> in the field of program assessment and evaluation in community colleges.

1.10 <u>What Is</u> in Community College Program Evaluation?

1.11 Programs are evaluated on the basis of weekly student contact hours (WSCH), or derived Average Daily Attendance (ADA). The reason for this approach is the more student hours in a program, the more money the institution collects from state aid in California. A problem with this approach is that is measures the educational process and not the product.

1.12 Many other approaches to evaluation lack measurability, and so lack a common basis upon which to compare one program with another, an existing program with a potential program.

1.13 All colleges have limited resources in relation to the demands of existing and proposed p ɔgrams.

1.14 Isolating program costs is difficult because of traditional line item accounting in education and because of limited definitions of cost.

1.15 Analyzing costs of a program measures what is being spent without necessarily analyzing what is being purchased in terms of output.

1.20 What Should Be in Community College Occupational Program Evaluation?

1.21 Students should know what measurable benefits they can reasonably expect from an occupational program.

1.22 Instructors should know how their program measures up on a common basis of output effectiveness and how their program can be made more effective.

1.23 Faculty, administration, and board members will be able to decide among alternative programs and resources the most effective and efficient ones.

1.24 The community should be aware of the measurable effectiveness of college programs so they may better judge how effectively tax dollars are being used, and what benefits the community is receiving from occupational programs.

2.00 Cost/Benefit Analysis to Fill the Gap Between What Is and What Should Be in Community College Occupational Program Evaluation

2.10 The cost/benefit model should fill the information need gap described in 1.21, 1.22, 1.23, and 1.24.

2.20 A Description of the Model - A step by step procedure to operate the model follows:

2.21 List appropriate cost and benefits to go into model. Lists of potential cost categories and measurable benefits are shown on pages 21 and 22. The model user should select those costs and benefits useable for his analysis. This selection process should involve input from the three segments of education - the learners, the institutional staff, and the community.

A match/mismatch technique is useful in arriving at the costs and benefits to be measured. The match/mismatch approach is illustrated on page 23.

2.22 Find the appropriate cost figures. The San Diego Community College District cost studies can be helpful to isolate institutional line item budgets to institutional direct and indirect costs.[1]

2.23 Information on benefits must be gathered and measured. In the case of learner benefits, this requires follow-up of former learners from programs. To begin with, follow-up should go back some years, perhaps five, to get a prospective about the development of ex-learners on-the-job. Decisions must be made about whether or not to include students who did not complete the program. If information from ex-learners follow-up show non-graduates are

[1] A Cost Accounting Model to Assess Actual Costs of Vocational and Non-Vocational Courses, San Diego Community Colleges, July, 1970. Report R70.12.

placed and succeed, this situation may call for investigation of the present program's length. A carefully drawn follow-up instrument can be useful in isolating benefits or costs not originally recognized The overall model should always be considered changeable and should constantly be checked for validity. Measurable results do not guarantee valid results.

A sampling follow-up technique recommended is to choose a stratified random sample which requires some of each ethnic and income or other significant characteristic of the total population being sampled.

2.24 Benefits in the model could be defined as additional income former students obtain after being in a program related to what they earned before. In this case, no control group is used. The benefit is actual money benefit productivity derived.

2.25 The costs and benefits derived should be cross-validated with representatives of the learner, institution of staff, community and/or other agreed upon validation.

2.26 By multiplying the average dollars increased earnings from the benefits sample and applying this to all former learners working in direct or related occupations, a total dollar income benefit is derived for an occupational program. This represents the number of ex-learners placed from one complete period of training.

2.27 The measurable benefit derived from 2.26 is then divided by the total cost of the program during that one complete period of training to arrive at the Return on Investment for the occupational program.

2.28 This approach then can be applied to various programs using the same cost and benefit criteria to provide a common measuring device for cost effectiveness.

2.30 Does the model fill the need gap described in section 1.21, 1.22, 1.23, and 1.24? To repeat these sections:

2.31 Students should know what measurable benefits they can reasonably expect from an occupational program.

2.311 Students are provided current placement and income data from surveys of the last previous class to determine the chances of their becoming employed from the program and the amount of money they might expect to earn.

2.32 Instructors should know how their program measures on a common basis of output effectiveness and how their program can be made more effective.

2.321 Placement is generally accepted as a measure of effectiveness of occupational programs. By translating placement into additional income earned by ex-learners, this dollar amount can then be related to cost of a program. A teacher wanting to make his program more effective can do so by (1) increasing placements, (2) increasing income placements

received, (3) reducing the cost of the program or any combination of these. It is also to the teacher's advantage under this model to keep track of his placements.

2.33 Faculty, administration, and board members will be able to decide among alternative programs and resources the most effective and efficient ones.

2.331 This model provides a common basis on which existing programs can be compared and by which new programs can be compared with existing programs. A decision to make additional investments in new programs or expanding existing programs can be effected by the expected return on investment of money invested.

2.34 The community should be aware of the measurable effectiveness of college programs so they may better judge how effectively tax dollars are being used, and what benefits the community is receiving from occupational programs.

2.341 Measurable results in terms of increased earnings for ex-learners of occupational programs can dramatically show community tax payers the returns they are getting for their money. Using the model would make it possible to develop an aggregate return on investment to show the return from all occupational programs in a college or district compared with the total cost of all programs.

3.00 Description of the Model

This generic cost/benefit model is designed to assist students, teachers, administrators, and the community in reaching a common ground in the assessment of the success of vocational programs. It is based upon the idea that program costs generate measurable return on investment in terms of income derived from placements of students who have completed the program. The model, which includes a selection of costs to be assessed and to be analyzed in terms of program costs and benefits to be derived, provides flexibility so that model users may develop specific models from the generic model, a specific model for their college or district, which meets the particular needs of the learner, faculty, administration, and community with which they are dealing.

3.10 The Reason for the Model

It is important to have a model that assesses both costs and benefits derived from these costs. This model provides a tool by which such assessment can be made.

3.20 Major Phases of Mission Profile

There are several phases that need to be covered in the development of the generic model. The following outline indicates these phases, to be referred to as the "mission profile". This outline may be used as a checklist in developing and adopting the generic model to a specific application.

MAJOR PHASES OF COST/BENEFIT MODEL

MISSION PROFILE

I. Determine requirements for cost/benefit analysis

- A. Criteria for participation in cost/benefit analysis task force
- B. List cost/benefit analysis task force representatives
- C. List criteria for cost/benefit analysis
- D. Obtain cost/benefit analysis criteria

II. Select programs to be analyzed

- A. Determine previous and current direct costs
- B. Determine previous and current indirect costs
- C. Determine current vocational education program learners
- D. Determine vocational educational learners placed

III. Derive dollar benefit determination model

- A. List costs and benefits information available
- B. List criteria for cost/benefit analysis
- C. Match costs and benefits information available and criteria for cost/benefit analysis
- D. List costs and benefits to be analyzed on programs selected

IV. Determine utility of dollar benefit model by pilot test

- A. Determine previous and current direct costs
- B. Determine previous and current indirect costs
- C. Determine vocational education benefits
- D. Determine dollar benefit by year

V. Cross validate to see if model achieves the objective of the model and performance requirements

VI. Obtain approvals for use of model

VII. Revise as required

3.30 Some Comments on the Mission Profile

3.31 Participation in the Cost/Benefit Analysis Task Force

Participation should include representatives from the various communities of a college, students, faculty, administration, board members and the public. In order to arrive at the most representative selection of costs and benefits to be analyzed, input from all the segments of the college community is very important.

3.32 Gathering Cost Data

Standard school accounts may not reflect all the costs which should be assessed for programs. Examples are costs of buildings and equipment, as well as student lost wages while training. In our application of the generic cost/benefit model to the College of Alameda, we added building and equipment costs on depreciated bases using formulae shown on pages 24 and 25.

3.33 Gathering Benefit Data

The most difficult task in benefit analysis of course, is selecting valid, measurable benefits. In occupational programs, income, job retention, promotion rates are measurable and can be obtained through student follow-up studies. Follow-up must be done regularly, using commonly agreed upon survey forms.

3.34 Match/Mismatch Technique

Agreement on cost and benefit criteria by the segments of the

college may require a match/mismatch process as illustrated on page 23.

3.40 Use of Time, Tasks, Talent (Gantt) Chart

The Gantt chart for this model provides a useful management method for scheduling necessary tasks to be completed. The chart also delineates levels of responsibility for tasks thus tending to establish accountability for the completion of necessary tasks. An example of a time, tasks, talent chart for this cost/benefit model is shown on page 20.

Some applications for this type of chart are:

A. Time Section

1. Projection of linear time spreads or intervals for each task
   a) Bar line (time lines) and deltas (bench marks) may be used to project starting dates, periods of accelerated effort and completion dates.
   b) Bar line and deltas may be filled in or patterned chart tape used to reflect actual starting dates, completion dates, etc.
2. Projection of manpower requirements

B. Task Section

1. Provides a detailed outline of tasks required for a project
2. Provides a check point for reference notes, committee decision, trouble points encountered, change in plan of action, etc.
3. Insures proper sequencing of tasks and activities.

C. Talent Section

1. Identifies communication channels

2. Delineates assignment of responsibilities

3. Total hours expended per task may also be recorded in this area to provide information for cost analysis of the total project. [2]

4.00 Explanation of How the Model was Applied at College of Alameda

4.10 Selection of which costs and which benefits should be used in the application of the model at College of Alameda was determined as follows:

4.11 The institutional direct and indirect costs were selected on the basis for costing programs because the model's use was determined to be primarily for the allocations and reallocation of institutional resources. Significant costs, such as lost student wages, were not included in the application at College of Alameda because of the stress on institutional resource allocation. Included in the program costs were allocations of building space, the cost per square foot of space used, and also depreciation expense of equipment. The method of allocating costs was to use the San Diego Community College cost allocation formula, with some modifications for the addition of allocation of equipment costs, space, and also some adjustments were made because of the kinds of information available.

4.12 Benefits used were benefits to the student who had completed the vocational program and was placed in the field for which he was trained. Benefits were determined as being the increased earnings of the student graduate of the programs as compared with his earnings before or what average earnings for people of his

[2] "Management Action Paper", Vol. 1 No. 7 - April 3, 1972, Office of Los Angeles County Superintendent of Schools

age were in the area served. Placement on the job was agreed to be the central thrust of the vocational programs by teachers, students, and administration, and therefore, should be the central element of benefits in the cost/benefit analysis.

4.20 Description of the Programs Analyzed at College of Alameda

The cost/benefit analysis model was applied to three vocational programs at College of Alameda - Business Equipment Technology, Dental Assisting, and Diesel Mechanics.

The catalog descriptions for these programs are included on pages 33 through 47.

4.21 The Business Equipment Technology program trains students for employment in repairing office machines, including manual and electric typewriters, adding machines, and duplicating equipment. In 1968, 1969, and 1970 Business Equipment Technology was a two year program. In 1971 and 1972 it was compressed into a one year program. The program in BET placed a high number of students. Entering students come from general college population and are also referred from special programs, such as Vocational Rehabilitation, Bureau of Indian Affairs, Manpower Development and Training, and other similar agencies. Instructors in the Business Equipment Technology class have a close working relationship with the employers in the area, and keep good records

on the number of placements that they make and the location of the placements, and how much money they earn.

4.22 The Dental Assisting program was a two year program in 1968 and 1969. In 1970 it became a three semester program and in 1971 and 1972 it was a one year program. This program, as other vocational programs, relies on service-type courses to complete the program. For example, Dental Assisting students are required to take typing, and a general accounting course, among others. In developing program costs, a portion of the cost of the typing program has been assessed to the Dental Assisting program, based upon the relationship of the total enrollment in the typing program to the portion of the enrollment that is represented by Dental Assisting.

4.23 Diesel Mechanics is a two year program which prepares students to go into the Diesel Mechanics trade. The students from the program are placed in pre-apprenticeship standing. Forty to fifty percent of the students in the program come directly from high school. Some others have been mechanics and the diesel training gives them additional skill, but does not provide an immediate increase in earning power.

4.30 Isolation of Costs to Programs

As was indicated earlier, the process by which costs were developed for programs stated using the San Diego cost accounting model as a

basis. The San Diego model developed costs for courses. These course costs were then added together based upon the courses required in the program to arrive at the total program cost. Some additional cost formulae were added - those for the assessment of depreciation expense of equipment and for the assessment for the square footage used in the program. In the case of support programs, such as the typing required by Dental Assisting, allocation of the total course costs for typing was made on the basis of the number of people enrolled in Dental Assisting during the year, and the total rumber of people enrolled in typing during the year.

4.40 Methods Assessing Benefits in Dental Assisting, Diesel Mechanics, and Business Equipment Technology

Since a significant use of this cost/benefit model should be to assist in the allocation of resources, as many significant resources (costs) as possible should be built into the model. Often building space and equipment are ignored in assessment of educational costs since they are non-cash items. Money spent for equipment and buildings has been spent often in the past, in an earlier fiscal year and, therefore, is not considered in costing of programs. But buildings and educational equipment account for considerable dollar expenditures and should be included in the allocation of total costs. For this reason, two formulae are added to the San Diego Cost Analysis formulae to allocate costs of building space and equipment. Both these formulae, (see pages 24 and 25) allocate costs over a period of time or expected life. For buildings, twenty years was used. For equipment, five to ten years was used. These periods of time were arrived at in consultation with college and district staff and industrial personnel

and they reflect not only physical life but also obsolescence. Obsolescence in occupational programs may well significantly reduce the expected life of equipment and even building space alloted to programs.

4.50 The results of the placement follow-up survey for the three occupational programs surveyed at College of Alameda shows the relationship between the student salaries before training and the amount earned after placement, compared with the cost per placement. These comparisons are shown on pages 30, 31, and 32 , entitled, "Program Costs and Initial Income Benefit Analysis." The survey covered five graduating classes from 1968 - 1972. This five-year analysis dampened the effect of one good or bad economic year on the total result. The cost/benefit analysis should be a continuing study so that the analysis for occupational programs is not based on one or two years, but a number of years over a period of time so that temporary economic effects do not overly bias the results. Student income figures were adjusted for inflation, using the year 1967-1968 as a base year.

5.00 Some Conclusions from the Pilot Study

The survey follow-up of students indicated that the increased income initially going into the field was quite small. Some students actually earned less upon placement in the field than they had earned before. Students and faculty should be aware of the initial salary rates for the trades in which they are training so that students can make, perhaps, more intelligent choices as to their vocational areas. In addition, over a longer period of time, students do tend to earn increasing amounts and a careful analysis of the initial

rates, plus the rates earned after a period of time, along with turnover of jobs and job satisfaction should be an important part of the data accumulated to assess the effectiveness of vocational programs. Although presently certain records are kept on placement and income, the uniformity and the extensiveness of these records should be improved. It is our observation that the follow-up on students to obtain income information is not as difficult as generally assumed and that it can and should be done on a regular basis. Some average entry of salary figures could be provided to vocational students as they enter vocational programs so that they can better assess the potential. This information could be available in college-wide booklets so that students are aware of the income potential of various areas before they make a commitment to the program. The faculty and administration should be aware of the continuing changes in income and employment pictures for the various vocational programs, so that the programs can continue to improve their effectiveness in placement and income potential for the students.

6.00 Other Uses of Cost/Benefit Analysis Model

The CCOPES (Community College Occupational Programs Evaluation System) includes in its component "goals" and "measurable objectives." Under these measurable objectives are student employment placement and other criteria for student benefits, including job success. The cost/benefit analysis can be a valuable instrument which can compliment the CCOPES program in assessing the effectiveness of these occupational programs.

A comparison of initial salaries for a new program should be compared with average income potential for present vocational programs and related to the cost of the new program in order to give some measure of desirability

of investment in new programs in relation to those presently being operated. The faculty and administration of the college then have a basis upon which to determine whether investment in a new program would return as great a benefit tc the student as an expansion of present programs.

APPENDIX

Cost/Benefit Analysis, VEA Part "C" Project
Mission Objectives and Performance Requirements

0.0 Mission Objectives

By August 1, 1972, the principle investigator of the VEA Project #01-61267-C101-71, (Fred E. Ittner, Business Division Chairman), will develop a model which will, when used, determine the dollar benefit of vocational education programs by measuring the cost per student placed in the vocational area for which he is trained with the income of students placed. The costs will include all identifiable and direct and indirect costs. Income will be derived from a stratified random sample of at least twenty percent of the graduates placed during each of the past five years. Resulting data will be approved by the Dean of Vocational Education, College of Alameda.

Performance Requirements

1. The model developed at College of Alameda will be exportable - usable at other colleges as judged by at least four of five vocational deans from other colleges in California.

2. Costs shall include all direct and indirect costs, including salaries of instructors, portions of salaries for counseling and administrative functions, supplies, equipment, and building space used by the program.

3. Total cost shall be divided by the number of students placed to determine the cost per student placed.

4. Income per student shall be on a value-added basis.

   A. Value-added shall be arrived at by comparing the actual or expected incomes without training to income after training.

   B. Income without training shall be determined by Department of Human Resources Development information on salaries of people with education levels similar to those in the vocational programs.

   C. -or by income levels actually obtained by students prior to entering the programs.

5. The number of students placed shall be identified by college placement records and records showing certificates of completion.

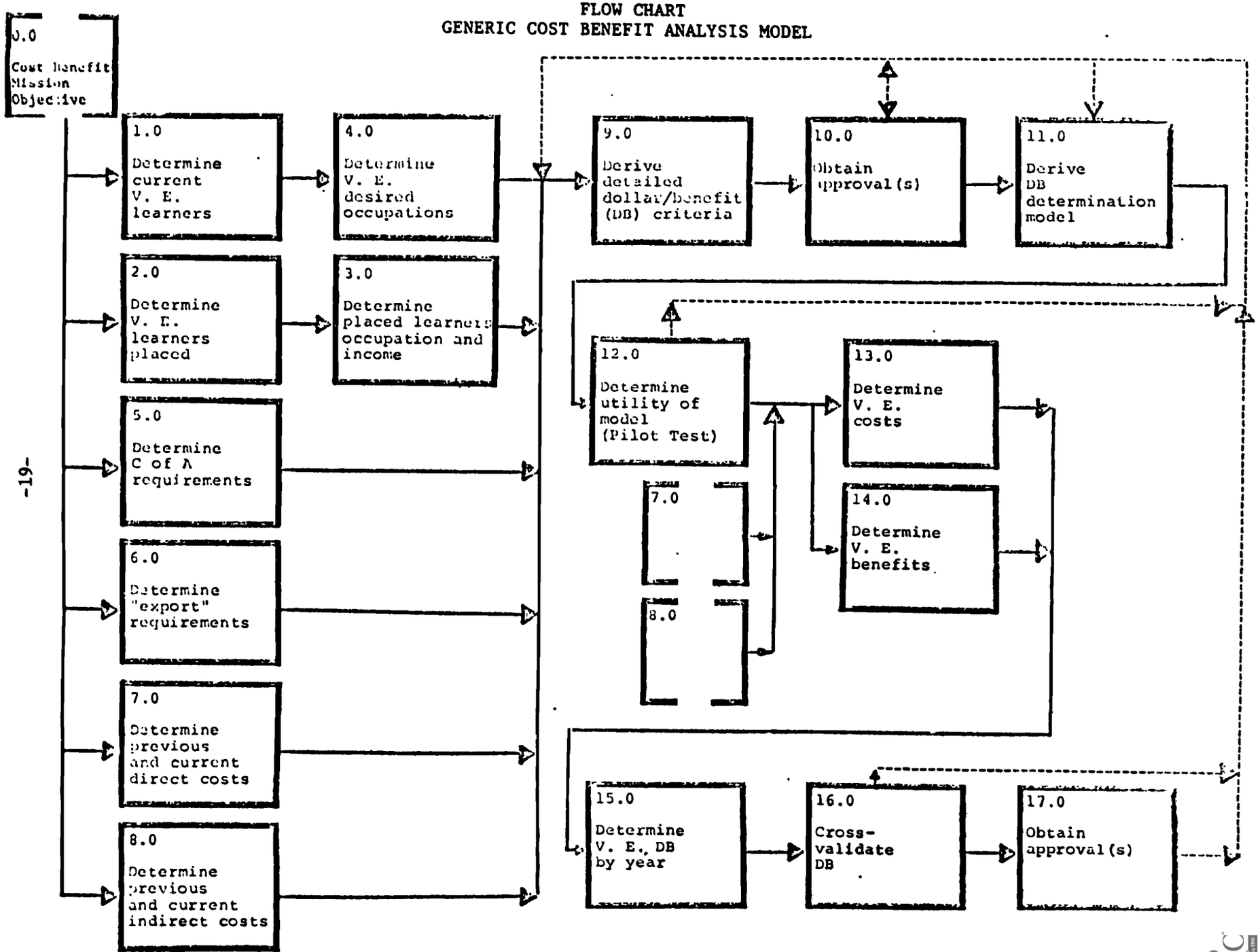
6. A sample of at least twenty percent of placements in the last five years shall be selected from vocational programs being surveyed using a stratified random sample.

7. Results shall be expressed in return on investment for vocational programs.

8. Return on Investment formula will be as follows:

$$\frac{\text{Income first year after training - Annual income without training}}{\text{Cost of program per student placed}}$$

FLOW CHART
GENERIC COST BENEFIT ANALYSIS MODEL



GANTT CHART

TIME (In Months) 1 2 3 4 5 6 7 8 9 10 11 12

TASKS

TALENT

TASKS	President	Task Force	Dean of Instruction	Vocational Education Dean	Faculty	Learners	Board	Community Representatives	Advisory Committee Repres.	Support Personnel
1.0 Determine Current V.E. Learners										
2.0 Determine V. E. Learners Placed										
3.0 Determine Placed Learners Occupation & Income										
4.0 Determine V. E. Desired Occupations										
5.0 Determine C of A Requirements										
6.0 Determine "export" Requirements										
7.0 Determine Previous & Current Direct Costs										
8.0 Determine Previous and Current Indirect Costs										
9.0 Derive Detailed Dollar/Benefit (DB) Criteria										
10.0 Obtain Approval(s)										
11.0 Derive DB Determination Model										
12.0 Determine Utility of Model (Pilot Test)										
13.0 Determine V. E. Costs										
14.0 Determine V. E. Benefits										
15.0 Determine V. E. DB by Year										
16.0 Cross-Validate DB										
17.0 Obtain Approval(s)										

P - Primary Responsibility
S - Support Responsibility
I - Needs Information

EXAMPLES OF COSTS

INSTITUTION

Direct

Teacher salaries
Supplies
Equipment
Class space
Lab space
Teacher aide
Lab assistant
Tool room keeper
Tools
Instructional materials
Fringe benefits
Leasing

Indirect

Administration
Custodial
Maintenance
Counseling
Depreciation - building
storage
equipment

LEARNER

Direct

Books
Tools
Materials
Lost wages
Transportation

Indirect

Study time
Failure - repeat time

COMMUNITY

Direct

Taxes - school overrides
Bonds - school

Indirect

Competition in job market
Change in welfare
Change in costs of penal
institutions

EXAMPLES OF BENEFITS

INSTITUTION

Direct

More money from local/state
More money from Federal Special programs
Cut-off point student benefits
Length of course - longer course, more money
Number of people successfully completing course - advertising
Accreditation

Indirect

Benefits to staff
Decreasing turnover
Increasing satisfaction
Decrease in low effective staff

STUDENT

Direct

Fewer layoffs
Fewer firings
Increased income
Reduction in sick leave
Numbers signing for additional training

Indirect

Less arrests
Less commitment to mental institution
Reduction in divorce rate/ desertion
Obtains first or second job choice more frequently than before training
Less job turnover than before training
No longer requires public support
Measureably increased self concepts
(Measured by standard tests)
(Tennessee Test of Self Awareness)
Purpose in Life test
Placements in related advanced education

COMMUNITY

Direct

Better trained work force
Less unemployment
Pride in college
Lower taxes

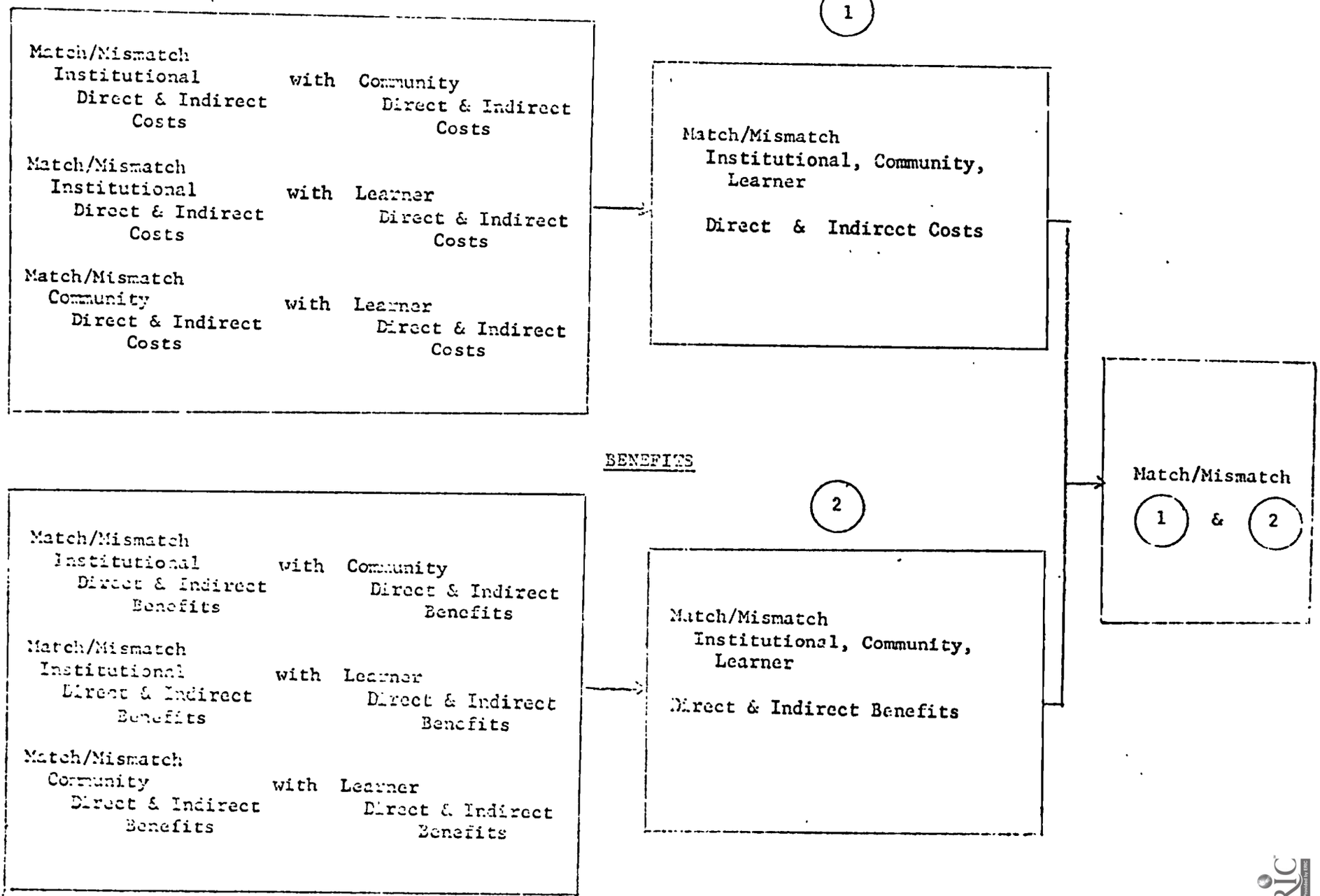
Indirect

Lower crime rate
More public participation in community
Greater public awareness of community

MATCH-/MISMATCH

COST/BENEFIT ANALYSIS

COSTS



FORMULA FOR THE

ALLOCATION OF ROOM SPACE COST

ROOM AREA IN SQUARE FEET (X) COST OF BUILDING PER SQUARE FOOT

EQUALS

COST OF ROOM

COST OF ROOM (X) $\frac{\text{DAILY ROOM USE FOR ONE SECTION}}{\text{TOTAL DAILY ROOM USE}}$ EQUALS

ALLOCATION OF ROOM COST TO ONE CLASS SECTION

FORMULA FOR THE

ALLOCATION OF EQUIPMENT COSTS

$$\frac{\text{EQUIPMENT COST}}{\text{EXPECTED LIFE OF EQUIPMENT}} \quad (X) \quad \frac{\text{DAILY USE OF ONE SECTION}}{\text{TOTAL TIME EQUIPMENT IS USED DAILY}}$$

EQUALS

ALLOCATED COST OF EQUIPMENT TO ONE SECTION

PROGRAM LENGTH OF TIME (1)

	1968	1969	1970	1971	1972
Business Equipment Technology	2 years	2 years	2 years	1 year	1 year
Dental Assisting	2 years	2 years	3 semesters	1 year	1 year
Diesel Mechanics	2 years	2 years	2 years	2 years	2 years

(1) Although certificate could be issued in less than 2 years, sequence of courses required 2 years of work

BUSINESS EQUIPMENT TECHNOLOGY

PROGRAM COSTS

	1968 (1)	1969 (1)	1970 (1)	1971 (2)	1972 (2)
DIRECT (3)	$ 35,886	$ 34,275	$ 40,908	$ 30,807	$ 30,960
INDIRECT (4)	$ 19,052	$ 21,434	$ 24,286	$ 13,260	$ 13,560
TOTAL	$ 54,938	$ 55,709	$ 65,194	$ 44,067	$ 44,520

(1) Two years required to complete program

(2) One year required to complete program

(3) Includes teachers salaries, supplies, depreciation on equipment, building and other direct expenses to the program

(4) Includes overhead, administrative costs and support costs. Allocation done using San Diego Community College cost allocation formulae. Also includes cost of support courses such as electronics in Business Equipment Technology

DENTAL ASSISTING

PROGRAM COSTS

	1968 (1)	1969 (1)	1970 (2)	1971 (3)	1972 (3)
DIRECT (4)	$ 42,902	$ 44,341	$ 35,360	$ 36,918	$ 38,024
INDIRECT (5)	17,130	17,413	18,583	23,464	25,424
TOTAL	$ 60,032	$ 61,754	$ 52,943	$ 60,382	$ 63,448

(1) Two years required to complete program

(2) Three quarters required to complete program

(3) One year required to complete program

(4) Includes teachers salaries, supplies, depreciation on equipment, building and other direct expenses to the program

(5) Includes overhead, administrative costs and support costs. Allocation done using San Diego Community College cost allocation formulae. Also includes cost of support courses.

DIESEL MECHANICS

PROGRAM COSTS

	1968 (1)	1969 (1)	1970 (1)	1971 (1)	1972 (1)
DIRECT (2)	$ 34,323	$ 35,970	$ 40,108	$ 59,213	$ 64,099
INDIRECT (3)	20,088	27,024	28,698	19,319	19,406
TOTAL	$ 54,411	$ 62,994	$ 68,806	$ 78,532	$ 83,505

(1) Two years required to complete program

(2) Includes teachers salaries, supplies, depreciation on equipment, building and other direct expenses to the program

(3) Includes overhead, administrative costs and support costs. Allocation done using San Diego Community College cost allocation formulae. Also includes cost of support courses such as electronics in Business Equipment Technology.

PROGRAM COST AND INITIAL INCOME BENEFIT ANALYSIS

Business Equipment Technology

N=31

Class of -	(1) Number Placed in Field Trained	(2) Initial Average Annual Salary less Annual Salary previous to training	(3) Program Cost	(4) Cost per Placement 3÷1	(5) Return on Investment 2÷4
1968	9	$ 447,00	$ 54,938	$ 6,104	7.3%
1969	14	1,196.00	55,709	3,979	30.0%
1970	26	1,260.00	65,194	2,507	50.3%
1971	15	686.00	44,067	2,937	23.3%
1972	18	1,040.00	44,520	2,473	42.0%

PROGRAM COST AND INITIAL INCOME BENEFIT ANALYSIS

Dental Assisting

N=21

Class of -	(1) Number Placed in Field Trained	(2) Initial Average Annual Salary less Annual Salary previous to training	(3) Program Cost	(4) Cost per Placement 3 ÷ 1	(5) Return on Investment 2 ÷ 4
1968	7	$ 378.00	$ 60,032	$ 8,576	4.4%
1969	6	1,004,00	61,754	10,292	9.8%
1970	17	1,378.00	52,943	3,114	44.2%
1971	NA*	1,312.00	60,382		
1972	NA*				

*Not Available

PROGRAM COST AND INITIAL INCOME BENEFIT ANALYSIS

Diesel Mechanics

N=20

Class of -	(1) Number Placed in Field Trained	(2) Initial Average Annual Salary less Annual Salary previous to training	(3) Program Cost	(4) Cost Per Placement 3 ÷ 1	(5) Return on Investment 2 − 4
1968	11	$ 2,110	$ 54,411	$ 4,946	42.6%
1969	5	2,075	62,994	12,598	12.5%
1970	7	2,260	68,806	9,829	23.0%
1971	6	2,381	78,532	13,088	18.2%
1972	6	2,472	83,505	13,917	17.8%

1967 - 1968

BUSINESS EQUIPMENT TECHNOLOGY

Requirements for the Associate in Science Degree

FIRST SEMESTER

Dept.	No.	Units.
Physical Education	___	½
Business Equipment Technology	51A*	3
Machine and Metals Technology	62*	2
Electives		6
		14½

SECOND SEMESTER

Dept.	No.	Units.
Physical Education	___	½
Business Equipment Technology	50B	3
Physical Science	51	2
Industrial Electrical Technology	73	2
Electives		4
		14½

THIRD SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50C*	3
Business Equipment Technology	51*	3
Industrial Electrical Technology	75	2
Electives		7
		15½

FOURTH SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50D	3
Business Equipment Technology	51D	3
Electives		9
		15½

A certificate will be awarded to those students completing a minimum of 32-34 units in the major program listed above plus 12 elective units in general education courses.
Electives required for the Associate degree must include:

English**	6 units
Health Education**	2 units
History 17A, 17B, 50 or 55**	3 units
Political Science 1A or 50**	3 units

1968 - 1969

BUSINESS EQUIPMENT TECHNOLOGY

Requirements for the Associate in Science Degree

FIRST SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50A*	3
Business Equipment Technology	51A*	3
Electrical/Industrial Control Technology	74	3
Electives		5
		14½

SECOND SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50B	3
Business Equipment Technology	51B	3
Physical Science	50 or 51	3-3
Electrical/Industrial Control Technology	75	3
Electives		2
		14½

THIRD SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50C*	3
Business Equipment Technology	51C*	3
Electives		9
		15½

FOURTH SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50D	3
Business Equipment Technology	51D	3
Electives		9
		15½

A certificate will be awarded to those students completing a minimum of 39-41 units in the major program listed above plus 6 electives units in general education courses.
Courses required for the Associate degree include:

English and/or Speech	6 units
Health Education	2 units
History 17A, 17B, 50 or 55	3 units
Political Science 1A, 1B, or 50	3 units

1969 - 1970

BUSINESS EQUIPMENT TECHNOLOGY

Requirements for the Associate in Science degree

FIRST SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50A*	3
Business Equipment Technology	51A*	3
Electrical/Industrial Control Technology	74	3
Electives		5
		14½

SECOND SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50B	3
Business Equipment Technology	51B	3
Physical Science 50 or	51	3-3
Electrical/Industrial Control Technology	75	3
Electives		2
		14½

THIRD SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50C*	3
Electives		9
		15½

FOURTH SEMESTER

Dept.	No.	Units
Physical Education	___	½
Business Equipment Technology	50D	3
Electives		9
		15½

Total Units 60

A certificate will be awarded to those students completing a minimum of 39-41 units in the major program listed above plus 6 elective units in general education courses.

Courses required for the Assoicate degree include:

English and/or Speech	6 units
Health Education	2 units
History 17A, 17B, 50, or 55	3 units
Political Science 1A, 1B, or 50	3 units

1970 - 1971

BET

50A MANUAL AND ELECTRIC TYPEWRITER 5 units F
5 hours lecture
Business Equipment Technology 51A must be taken concurrently.
Study of the theory, uses and processes related to the servicing of manual and electric typewriters.

50B ADDING MACHINES AND RELATED EQUIPMENT 5 units W
Prereq isite: Business Equipment Technology 50A and 51A.
Business Equipment Technology 51B must be taken concurrently.
A study of the use, theory of operation, mechanical systems and maintenance processes related to current model 10-key and full keyboard adding machines and current model printing calculator. Includes instruction in shipping and handling procedures, preparation of invoices, service contracts, and related business procedures.

50C ELECTROSTATIC COPIERS, HEAT COPIERS, AND DUPLICATORS
Prerequisite: Business Equipment Technology 51C 5 units S
Business Equipment Technology 51C must be taken concurrently.
A study of the use, theory of operation, mechanical systems and maintenance processes related to current model duplicators and electrosatic copiers, Includes instruction in shipping and handling procedures, preparation of invoices service contracts and related business procedures.

51A MANUAL AND ELECTRIC TYPEWRITERS LABORATORY 5 units F
15 hours laboratory
Business Equipment Technology 50A must be taken concurrently.
Consists of shop practice in disassembly, cleaning assembly, conventional repairs and troubleshooting practice on current model machines practice in handling and shipping procedures; preparation of service reports and forms used in the industry; and practice in cost estimating and parts ordering.

51B ADDING MACHINES AND RELATED EQUIPMENT LABORATORY 5 units W
15 hours laboratory
Business Equipment Technology 50B must be taken concurrently.
Consists of practice in operation of machines, troubleshooting and corrective repairs and adjustments, disassembly and assembly work, cleaning and lubrication. Preparation of cost estimates, parts orders, service contract, and other procedures used in the normal conduct of business.

51C ELECTROSTATIC COPIERS, HEAT TRANSFER COPIERS, AND DUPLICATORS
15 hours laboratory 5 units S
Business Equipment Technology 50C must be taken concurrently.
Includes disassembly, cleaning, assembly and adjustment of the various types of machines; performance of normal types of repairs, preparation of work records and reports, estimating repair costs, parts ordering, and related shop procedures.

1971 - 1972

BET

50A MANUAL AND ELECTRIC TYPEWRITERS 5 units
5 hours lecture
Business Equipment Technology 51A must be taken concurrently.
Study of the theory, uses and processes related to the servicing of manual and electric typewriters.

50B ADDING MACHINES AND RELATED EQUIPMENT 5 units
5 hours lecture
Prerequisite: Business Equipment Technology 50A and 51A.
Business Equipment Technology 51B must be taken concurrently.
A study of the use, theory of operation, mechanical systems and maintenance processes related to current model 10-key and full keyboard adding machines and current model printing calculators. Includes instruction in shipping and handling procedures, preparation of invoices, service contracts, and related business procedures.

50C ELECTROSTATIC AND HEAT TRANSFER COPIERS AND DUPLICATORS 5 units
5 hours lecture
Prerequisite: Business Equipment Technology 50B and 51B.
Business Equipment Technology 51C must be taken concurrently.
A study of the use, theory of operation, mechanical systems and maintenance processes related to current model duplicators and electrostatic copiers. Includes instruction in shipping and handling procedures, preparation of invoices, service contracts and related business procedures.

51A MANUAL AND ELECTRIC TYPEWRITERS LABORATORY 5 units
15 hours laboratory
Business Equipment Technology 50A must be taken concurrently.
Consists of shop practice in disassembly, cleaning, assembly, conventional repairs and troubleshooting practice on current model machines; practice in handling and shipping procedures; preparation of service reports and forms used in the industry; and practice in cost estimating and parts ordering.

51B ADDING MACHINES AND RELATED EQUIPMENT LABORATORY 5 units
15 hours laboratory
Business Equipment Technology 50B must be taken concurrently.
Consists of practice in operation of machines, troubleshooting and corrective repairs and adjustments, disassembly and assembly work, cleaning and lubrication. Preparation of cost estimates, parts orders, service contract, and other procedures used in the normal conduct of business.

51C ELECTROSTATIC AND HEAT TRANSFER COPIERS AND DUPLICATORS 5 units
15 hours laboratory
Business Equipment Technology 50C must be taken concurrently.
Includes disassembly, cleaning assembly and adjustment of the various types of machines; performance of normal types of repairs, preparation of work records and reports, estimating repair costs, parts ordering, and related shop procedures.

51D SPECIAL PROJECTS 3-7 units
10-20 hours laboratory
Prerequisite: Business Equipment Technology 50A, 50B, 50C, 51A, 51B, 51C.
Not required for a Certificate of Completion in Business Equipment Technology.
Open lab for trouble shooting, repair, servicing and testing of a variety of business machines.

1967 - 1968

DENTAL ASSISTING

Requirements for the Associate in Science Degree

FIRST SEMESTER

Dept.	No.	Units
Physical Education		1/2
Dental Assisting	67	4
Dental Assisting	71	2
Business	76A	2
Electives		3
		15 1/2

SECOND SEMESTER

Dept.	No.	Units
Physical Education		1/2
Dental Assisting	70A	3
Dental Assisting	73A	2
Business	76B	2
Speech		3
		15 1/2

THIRD SEMESTER

Dept.	No.	Units
Physical Education		1/2
Dental Assisting	70B	3
Dental Assisting	73B	3
Dental Assisting	74	2
Dental Assisting	76C	2
Business	91	3
Electives		3
		16 1/2

FOURTH SEMESTER

Dept.	No.	Units
Physical Education		1/2
Dental Assisting	70C	5
Dental Assisting	73C	2
Electives		8
		15 1/2

Total Units 60

A certificate will be awarded to those students completing a minimum of 44-46 units in the major program listed above.
Electives required for the Associate degree must include:

English**	3 units
Health Education**	2 units
History 17A, 17B, 50, or 55**	3 units
Political Science 1A or 50**	

1968 - 1969

DENTAL ASSISTING

Requirements for the Associate in Science degree

FIRST SEMESTER

Dept.	No.	Units
Physical Education		½
Dental Assisting	67	4
Dental Assisting	71	2
Dental Assisting	76A	2
Business	61B	3
Electives		3
		14½

SECOND SEMESTER

Dept.	No.	Units
Physical Education		½
Dental Assisting	70A	3
Dental Assisting	73A	2
Dental Assisting	76B	2
Business	54	3
Speech	51A	3
		13½

THIRD SEMESTER

Dept.	No.	Units
Physical Education		½
Dental Assisting	70B	3
Dental Assisting	73B	2
Dental Assisting	74	2
Dental Assisting	76C	2
Business	91	3
Electives		3
		15½

FOURTH SEMESTER

Dept.	No.	Units
Physical Education		½
Dental Assisting	70C	5
Dental Assisting	73C	2
Electives		9
		16½

A certificate will be awarded to those students completing a minimum of 43-45 units in the major program listed above.
Courses required for the Associate degree include:

English and/or Speech	3 units
Health Education	2 units
History 17A, 17B, 50, or 55	3 units
Political Science 1A, 1B, or 50	3 units

1969 - 1970

DENTAL ASSISTING

Requirements for the Certificate

FIRST SEMESTER

Dept.	No.	Units
Physical Education	67	½
Dental Assisting	71	4
Dental Assisting	76A	2
Business	61B	2
Electives		3
		3
		14½

SECOND SEMESTER

Dept.	No.	Units
Physical Education	70A	½
Dental Assisting	73A	3
Dental Assisting	76B	2
Business	54	2
Speech	51A	3
		3
		13½

THIRD SEMESTER

Dept.	No.	Units
Physical Education	70B	½
Dental Assisting	73B	3
Dental Assisting	74	2
Dental Assisting	76C	2
Business	55	2
Electives		3
		3
		15½

A certificate will be awarded to those students completing a minimum of 36-36½ units in the major program listed above.

Recommended courses:

Dental Assisting 70C, 73C

Requirements for the Associate in Science degree

60 units must be earned including the above courses and the following:

English and/or Speech	3 units
Health Education	2 units
History 17A, 17B, 50, or 55	3 units
Political Science 1A, 1B, or 50	

1970 - 1971

DENTAL ASSISTING

Requirements for the Associate in Science Degree

FALL QUARTER

Dept.	No.	Units
Physical Education	___	½
English		3
Business		3
Business	40B	3
Dental Assisting	74	2
Dental Assisting	67A	4
		15½

WINTER QUARTER

Dept.	No.	Units
Physical Education	___	½
Dental Assisting	67B	4
Dental Assisting	70A	4
Dental Assisting	73A	2
Dental Assisting	76A	2
Electives		3
		15½

SPRING QUARTER

Dept.	No.	Units
Physical Education	___	½
Dental Assisting	70B	4
Dental Assisting	73B	2
Dental Assisting	75	2
Dental Assisting	67B	2
Speech		3
Electives		2
		15½

SUMMER SESSION

Dept.	No.	Units
Physical Education	___	½
Dental Assisting	70C	8
Dental Assisting	76C	8
		16½

Recommended Courses:
- Psychology
- Sociology

Required Courses:
- Business 10

1971 - 1972

DENTAL ASSISTING

Requirements for the Associate in Science Degree

FALL QUARTER

		Units
Business	40B	3
Business	42A	3
Dental Assisting	67	1
Dental Assisting	67A	3
Dental Assisting	74	2
Physical Education		1/2
Speech	25 or 1	2
		16 1/2

WINTER QUARTER

		Units
Business	42B	4
Dental Assisting	67B	4
Dental Assisting	70A	4
Dental Assisting	73A	2
Dental Assisting	76A	2
Physical Education		1/2
		16 1/2

SPRING QUARTER

		Units
Business	10	4
Dental Assisting	70B	4
Dental Assisting	73B	2
Dental Assisting	75	2
Dental Assisting	76B	2
Physical Education		1/2
		14 1/2

SUMMER SESSION

		Units
Dental Assisting	70C	5
Dental Assisting	76C	2
Physical Education		1/2
		7 1/2

1967 - 1968

DIESEL MECHANICS

Requirements for the Associate in Science Degree

FIRST SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60A	3
Automotive	65A	6
English	59 or 60A	3-3
Machine and Metals Technology	62	2
		14½

SECOND SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60B	3
Automotive	65B	6
Automotive	63	2
Physical Science	51	2
Electives		2
		15½

THIRD SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60C or 60D	3-2
Automotive	65c	6
Machine and Metals Technology	63	1
Electives		5
		15½-14½

FOURTH SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60C or 60D	3-2
Automotive	65D	6
Automotive	61	2
Electives		4
		15½-14½

A certificate will be awarded to those students completing a minimum of 41-43 units in the major program listed above. A student completing only a portion of the certificate curriculum is not endorsed by the college as being fully qualified for employment in the diesel mechanics field.

Electives required for the Associate degree must include:

English**	6 units
Health Education**	2 units
History 17A, 17B, 50, or 55**	3 units
Political Science 1A or 50**	3 units

1968 - 1969

DIESEL MECHANICS

Requirements for the Assoicate in Science Degree

FIRST SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60A	3
Automotive	65A	6
English	59 or 60	3-3
Machine and Metals Technology	62	2
		14½

SECOND SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60B	3
Automotive	65B	6
Automotive	63	2
Physical Science	50 or 51	3-3
		14½

THIRD SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60C or 60D*	3-2
Automotive	65C*	6
Machine and Metals Technology	63	1
Electives		5

FOURTH SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60C or 60D*	3-2
Automotive	65D	6
Automotive	61	2
Electives		5
		15½-16½

A certificate will be awarded to those students completing a minimum of of 48-50 units in the major program listed above. A student completing only a portion of the certificate curriculum is not endorsed by the college as being fully qualified for employment in the diesel mechanics field.

*60C and 65C are not prerequisite to courses 60D and 65D.

1969 - 1970

DIESEL MECHANICS

Requirements for the Associate in Science degree

FIRST SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60A	3
Automotive	65A	6
English	59 or 60	3-3
Machine and Metals Technology	62	2
		14½

SECOND SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60B	3
Automotive	65B	6
Automotive	63	2
Physical Science	50 or 51	3-3
		14½

THIRD SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60C or 60D*	3-2
Automotive	65C*	6
Machine and Metals Technology	63	1
Electives		5
		14½-15½

FOURTH SEMESTER

Dept.	No.	Units
Physical Education		½
Automotive	60C or 60D*	
Automotive	65D	6
Automotive	61	2
Electives		5
		15½-16½

A certificate will be awarded to those students completing a minimum of of 48-50 units in the major program listed above. A student completing only a portion of the certificate curriculum is not endorsed by the college as being fully qualified for employment in the diesel mechanics field. Course required for the Associate degree include:

English and/or Speech	6 units
Health Education	2 units
History 17A, 17B, 50, or 55	3 units
Political Science 1A, 1B, or 50	3 units

1970 - 1971

DIESEL MECHANICS

30 BASIC DIESEL ENGINE PRINCIPLES 2 units
2 hours lecture
Open to automotive students.
Lecture on tools and instruments, internal combustion engine theory, and engine types.

31 FUEL INJECTION AND COMBUSION 2 units
2 hours lecture
Open to automotive students
Study of combustion chambers, governors, and fuel injection.

32 ADVANCED DIESEL ENGINE PRINCIPLES 2 units
2 hours lecture
Advanced study of engine principles, engine power and fuel consumption, and engine ratings and performance.

33 DIESEL ENGINE TUNE-UP AND TESTING 2 units
2 hours lecture
Study of horsepower, torque, engine tune-up and testing.

35A DIESEL MECHANICS 1 8 units
20 hours lecture-laboratory
Laboratory work on diesel engines with emphasis on engine disassembly, inspection and measurement of parts, and the use of tools and shop manuals.

35B DIESEL MECHANICS 2 8 units
20 hours lecture-laboratory
Laboratory work on diesel engines with emphasis on engine reassembly, settings and adjustments.

35C DIESEL MECHANICS 3 8 units
Laboratory work on diesel engines with emphasis on engine operation timing, tune-up and fuel injection calibration and repair.

35D DIESEL MECHANICS 4 8 units
20 hours lecture-laboratory
Laboratory work on diesel engines with emphasis on engine diagnosis and testing.

35E DIESEL MECHANICS 5 8 units
20 hours lecture-laboratory
Laboratory work on diesel equipment covering shop practices in service and repair, adjustment and maintenance of trucks, crawler type tractors, truck transmissions and differentials and marine reverse gears.

35F DIESEL MECHANICS 6 8 units
20 hours lecture-laboratory
Laboratory work on diesel equipment with emphasis on servicing and testing diesel generator sets, diesel electric systems, wheel bearings and air brakes.

1971 - 1972

DIESEL MECHANICS

Courses required for Associate in Science Degree:

FIRST QUARTER		Units
Automotive		3
Automotive	21	2
Automotive	30	2
Electives		3
Physical Education		½
		16½

SECOND QUARTER		Units
Automotive		2
Automotive		2
Automotive	35B	8
Electives		3
Physical Education		½
		15½

THIRD QUARTER		Units
Automotive	22	2
Automotive	32	2
Automotive	35C	8
Electives		2
Physical Education		½
		17½

FOURTH QUARTER		Units
Automotive	35D	8
Electives		8
Physical Education		½
		16½

FIFTH QUARTER		Units
Automotive	35E	8
Electives		5
Physical Education		½
		13½

SIXTH QUARTER		Units
Automotive	35F	8
Electives		5
Physical Education		½
		13½

Total Units 93

A Certificate of Completion will be awarded to those students completing a minimum of 63 units in the major program listed above.
Courses required for Associate in Science degree include:

English and/or Speech	9 units
Ethnic Studies	3 units
Health Education	3 units
History	5 units
Mathematics	5 units
Political Science	5 units

REFERENCES

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