DOCUMENT RESUME

ED 061 938 JC 720 111

TITLE	A Model for Cost Analysis of Vocational and Non-Vocational Credit Programs at Santa Barbara City College, 1971-72.
INSTITUTION	Santa Barbara City Coll., Calif. Office of Research and Development.
REPORT NO	RR-8-72
PUB DATE	26 Apr 72
NOTE	83p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Comparative Analysis; *Cost Effectiveness; Educational Finance; *Junior Colleges; Models; *Program Budgeting; *Program Costs; *Resource Allocations

ABSTRACT

Presented here is a model developed at Santa Barbara City College (California) for assessing vocational and non-vocational program costs. The primary purpose of the project was to compare costs during 1971-72 for these two types of programs. On an institutional average, vocational instructional costs appeared to be higher than non-vocational, perhaps because of the relatively lower ratio of student contact hours in vocational instruction. The model has value for predicting future resource requirements, evaluating the achievement of program objectives, and conducting cost-benefit analysis. Reports of a computer analysis of costs, program cost analysis, and cost benefit analysis are given along with three appendices: (1) contract costs and direct instructional costs, (2) comparison of vocational and non-vocational program costs, and (3) use of a vocationally-oriented test battery to increase student persistence and performance in selected curricula. (MB)

SANTA BARBARA CITY COLLEGE

April 26, 1972

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Research Report 8-72

A MODEL FOR COST ANALYSIS OF VOCATIONAL AND NON-VOCATIONAL CREDIT PROGRAMS AT SANTA BARBARA CITY COLLEGE 1971-72

This research was partially funded by VEA, Part C funding, Project Number N-42-69294-C055-71.

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I. Background

That there is a financial crisis in higher education is the generally accepted conclusion among community college, four-year college and university administrators in all states, and in both public and private education. In an abstract from a forthcoming book, The New Depression in Higher Education, author Earl Cheit noted that sixty-six percent of all institutions of higher education were either "in financial difficulty" or "headed for trouble."

Support of higher education has, in the opinion of experts among administrators and economists, suffered for several major reasons: (1) a general revolt against high taxes; (2) a reduced regard for higher education generally; (3) a reaction of older people against the current styles of younger people; (4) a lingering resentment of campus violence and student reaction against the social issues so dramatically culminated at Kent State and in Isla Vista.

Against the background of such suffering public support for higher education, the burden of proof for educational finance appears to be shifting inexorably to the institutions themselves. A request for finance to the electorate or to the legislature is not of itself sufficient for institutions of higher education any more: it must also be demonstrated that the money will in fact be well used.

In Cheit's opinion, there are three aspects of the task of restoring confidence in higher education, and thereby re-establishing the value of the investment in the functions of higher education. In Cheit's words, "First, the colleges and universities must have campuses that reveal themselves as being reasonably governable: . . "A second requirement for confidence is that they are reasonably efficient in their internal operations: . . "Thirdly, . . restored confidence will require convincing evidence that the activities of colleges and universities have a unifying set of purposes - purposes that the supporting public can understand and defer to." (Earl F. Cheit, "Outsider's Look at Financial Crisis in Higher Education," The Chronicle of Higher Education, V:11, December 7, 1970)

II. The Thrust for Program Budgeting

There is some evidence to suggest that community colleges are taking Cheit's three aspects of the task of restoring confidence seriously. Fortunately, history seems to have operated on the side of the community colleges in the area of campus governance, at least to the extent that major confrontations in higher education have been more likely to occur on campuses of the state university or the state college

system than on one of the local community college campuses. Further, because the community colleges retain a fierce sense of local autonomy, they have been in a better position to respond quickly to local pressures from their communities, and have remained relatively unhampered by the requirements of belonging to a state wide system, as compared with their more cumbersome senior partners.

Currently, there is much interest in the setting of institutional goals and objectives. The California School Boards Association recently published a set of case studies called Evolving Educational Goals for California Schools, a document which described the efforts of several school districts to involve their communities in an examination of the goals and objectives for education.

Perhaps the major activity has been in the area of investigating what Cheit has labeled the "internal efficiency" of the community colleges. Dr. Otto Heinkel published "A Cost Accounting Model to Assess Actual Costs of Vocational and Non-Vocational Courses" in the San Diego District in July, 1970 as a background paper for the Chancellor's Advisory Committee on Cost Effectiveness for the California Community Colleges. Heinkel's paper represented a significant attempt to provide the hard data on costs that could provide a partial basis for decision-making on the cost-benefits model. In November, 1970, the California Junior College Association Ad Hoc Committee on Program Budgeting published an Interim report calling for the establishment of a program budgeting system in the community colleges by 1974.

Nationally, Wattenbarger, Cage and Arney prepared and published an intensive study of 15 exemplary colleges in June, 1970 titled The Community Junior College: Target Population, Program Costs and Cost Differentials; that study was perhaps the most influential available model stressing the probable impact of and need for comparative data at the program level in all community colleges.

III. The State of the Art

Several elements of cost analytic studies have been sharply identified in the several documents noted above. Wattenbarger and associates limited their study to "current operating expenses incurred for general administration, instructional salaries, other instructional services, operation and maintenance of plant, operation of the learning resources center, auxiliary services, student personnel services, and to a limited extent, equipment." (Wattenbarger, et. al., 1970, p. 20)

The national study made a telling list of points against the inclusion of capital outlay expenditures in cost analytic models, to which attention was given in the design of the present model:

1. Colleges that have been in operation for many years had no need to keep up-to-date records on equipment since they were not required to provide depreciation schedules for auditing purposes.

2. Much of the equipment used in occupational programs in many colleges was "used" equipment, surplus property, or donated by industry, making it difficult to assign a comparable dollar value on such equipment.

3. Several programs, data processing for example, have used rental equipment, and when rental expense is computed as a part of the program operating cost, it inflates the cost differential tremendously.

4. It is very difficult to get a panel of judges to agree on the length of time appropriate to depreciate the total equipment, not to mention the price of equipment for a particular program. (Wattenbarger, et. al.,1970, p. 99)

If one purpose of developing basic cost data is to provide a basis for comparisons, both internal to the college and systems-wide, the inclusion of capital outlay expenditures would appear not to serve that purpose well. Alternative to actual costs, the national study considered a range of percentages of expenditures by category in a total instructional budget. Although the figures for eight community colleges included several from outside of California, where expenditures by category have legislative or administrative mandates behind them, the table provides an excellent point of reference for estimating proportions of allocations in seven budget categories.

Percent of Budgetary Allocations for Eight Community Junior Colleges

Budget Category	E	N	M	C	K	F	H	A	Ave.
	Percents Rounded to Nearest Whole Number								
Instructional Salaries	42	54	53	53	44	62	47	57	51
General Administration	15	12	15	8	8	4	9	8	10
Oper. & Main. of Facilities	15	12	8	10	12	10	9	12	11
Instructional Resources	9	4	4	5	4	4	10	3	5
Student Personnel Services	7	13	7	5	8	11	8	11	9
Supportive Instr. Costs	7	4	12	15	12	9	15	8	10
Auxiliary Services	6	2	0	4	12	0	3	3	4

A number of studies have concentrated on estimating instructional costs exclusively on the basis of proportional estimates of expenditures, by program. Heinkel's study included 19 detailed formulas for estimating costs. Thus, for example, incremental teacher salary costs for each class section were calculated by the following formula:

$$X = (\$ \text{ Salary}) \times (H + \frac{h}{K}) \div (2H_T)$$

where H = weekly contact hours of exclusive instructors for class section.

h = weekly contact hours of instruction shared with other class sections.

K = Number of class sections sharing instructional period.

H_T = Total weekly contact hours of assigned teaching load.

(Heinkel, 1970, p. 30)

The study also included a "simplified cost method" of estimating course costs. When Heinkel compared the results of the detailed and simplified methods of estimating costs he found that "the exclusive use of class sections as a basis for distributing all costs with the exception of teachers salaries produces course cost differences up to 21 percent compared to the detailed cost analysis method." (Heinkel, 1970, p. 41) The authors of one study from Miami Dade, the Miami Dade Junior College Academic Accounting System, (ED050726) insisted that precise data on instructional salary costs would be undesirable in cost studies. In their words, "The most important consideration is one which is probably inconsistent with the desires of college business officials: Do not use actual salary when comparing costs of instruction from one area to another. Use the average faculty salary and multiply that by the number of positions in order to get a cost of a course or the cost of the operation of a department." (Miami-Dade, EDOJ0726) The authors firmly conclude "There is no other way" (emphasis theirs).

In part, the strong practical considerations that have caused most studies to focus on proportional expenditures relate to the immense difficulty of attaching individual line items defined in, for example, the California School Accounting Manual, with defined program or activity, centers of the community college. The State Center Community College District has, concurrently with the study reported in this paper, developed a district budget according to the following "Activity Centers." 1) General Services Centers (Board of Trustees, Superintendent, President, Community Services); Instructional Disciplines (by Classification of Instructional Administration; Instruction Related Centers (Library, Media, Tutorial); Student Services; Business and Plant Services; Facilities and Capital outlay.

The expenditures code includes 20 digits, allowing the district to associate any item expenditure both with the CSAM categories and with the activity centers of the colleges. The State Center Budget represents the culmination of efforts of the California Junior College Association Ad-Hoc Committee on Program Budgeting, chaired by Garland Peed.

To build the State Center Budget document as comprehensively as Peed and his staff did required a total revision of the budget approach of the district. This activity had taken place during the 1970-71 academic year, but was not reported generally in time to have an impact on the current study, since the Santa Barbara Community College District had not made such a total conversion.

IV. The Santa Barbara City College Study

From an assessment of the state of the art, and from the active support of the California Community Colleges Chancellor's Office for pilot testing of a revised budget structure, the direction of the current study was formed. Recognizing that the central intent of the project was to compare costs (expenditures) during 1971-72 for vocational and non-vocational programs, the research staff sought in addition to conduct an expenditure analysis in categories that would be as replicable as possible, given the strong impetus of program budgeting and the newly introduced reporting requirements for expressing instructional load in terms of the various Classification of Instructional Discipline (C.I.D.) categories.

Several methodological discussions were made which create limitations to the current study:

1. The analysis was to be made only in terms of CSAM budget categories 100 to 800, the current expense of education categories. This decision was made specifically to avoid the problems associated with analyzing capital outlay expenditures for heavy equipment in vocational programs. The central expenditure question was interpreted in this context to refer to the costs of operating or maintaining a program, as apposed to the spuriously inflated costs of initial acquisition or updating of heavy instructional hardware.

2. The analysis was to be made in terms of C.I.D. classifications for instruction, and for the following additional activity centers: (1) Administration of Instruction and Instructional Services; (2) Library Services; (3) Student Personnel, and; (4) General Administration of the District, including Business Services, Maintenance and Operations

3. The analysis was to be made on the basis of actual contract costs rather than average or formula-generated costs, where possible, and excluding hourly instructional program costs.

As the project proceeded, it became obvious that under the current budget structure in the district it would not be possible to associate each line item expenditure with an instructional discipline, by C.I.D., since the current division structure of the college followed entirely different subject matter clusters from those contained in the C.I.D. series. Thus, for example, it was not possible to ferret out the specific portion of "instructional supplies, general" from the Social Science Division budget which should be properly allocated to teach "Symbolic Logic", a course which may have been found wandering in the

"Mathematics" or "Letters" C.I.D. cluster. It was therefore necessary to compromise accuracy in this case by conducting an institutional analysis of direct instructional costs for all disciplines and establish an institutional estimate of the percent beyond 213 instructional salary costs which could be used to estimate additional resources expended, by C.I.D.

With the single exception, noted above, it was possible to conduct an accurate analysis of costs by C.I.D., using actual district budget figures for 1971-72. To accomplish this analysis, a series of computer programs were developed by Research Programmer Ann M. Robinson. A complete description of that program is given below.

V. The Computer Analysis of Costs

The problem of analyzing the actual cost of teachers with their courses and monthly-paid classified workers is solved in the two programs CCRDO3 and CCRDO4 (written in COBOL for a Burroughs B-2500 Computer). The first program is conceptually more difficult and requires less core, ~20,000 bytes, while the second program is a straightforward aggregation problem and requires more core, ~45,000 bytes.

The input to CCRDO3 is two files, presently named CCPERS (for City College Personnel) and CCCLAS (for City College Classes). The file CCPERS contains a seven (7) card (560-character) record for each contract-certificated teacher or administrator, day or evening college hourly-certificated teacher, and monthly-paid classified worker in the college. CCCLAS now contains a two (2) card (160-character) record for each class taught by each teacher of the college. Each employee is assigned an 8-digit employee number, the first 4 digits of which is the C.I.D. (Classification of Instructional Discipline) number in which the person works or teaches in the college, the next 2 digits represent an internal division number and the last 2 digits, an employee number, which is unique within the first 2 digits of the C.I.D. number. (Note the juxtaposition of the first 2 digits and the last 2 digits of the employee number gives a smaller unique number identifying the employee.) CCPERS is ordered in ascending employee number order. Each record of CCPERS contains all employee information including half-yearly pay, identifiable as contract, hourly or monthly (classified). CCCLAS is arranged in the same order as CCPERS. Each class record contains the employee number of the teacher of this class and appropriate class information, such as student enrollment, number of hours the class meets per week, number of TLU's (teacher load units) assigned to the course, whether the course is contract or hourly, and the C.I.D. number which classifies the course.

In program CCRDO3 the two files CCPERS and CCCLAS are read and compared; when a match is found the classes of the person are stored in the computer's memory while various calculations are performed. If the current person has no classes, such as a contract teacher on sabbatical leave, administrator, librarian, counselor, or classified worker, the person's record is processed in a straightforward way that yields only dollars assigned to a specific C.I.D. number. After collecting all the classes of a given teacher, the total number of contract and hourly TLU's is calculated. Using the half-yearly contract dollars and the half-yearly hourly dollars the cost per

course is obtained by the formula:

$$\text{Cost per course (Hourly or Contract)} = \frac{\text{Course TLU's}}{\text{Total TLU's (Hourly or Contract)}} \times \text{Teacher half-year Dollars (Hourly or Contract)}$$

Some special cases occur: apprenticeship courses have no TLU's, therefore the dollars (always hourly) are assigned without division to the course; guidance courses taught by counselors have no dollars, as no breakdown of counselor salary exists, therefore the correct TLU's and other information are assigned to the course, but no cost is calculated.

The program CCRDO3 produces two outputs: one, a report called CCDETØ ("DET" = detailed report) which lists the personnel of the college and for each person the dollars and other information associated with him, and the other, a tape called CCINTE ("INTE" = intermediate file) which is used as input to program CCRDO4 and contains the same information as the report CCDETØ but does not transfer persons' names.

CCDETØ lists in ascending employee number order all the C.I.D. numbers of the courses the person teaches (all courses with the same C.I.D. number are aggregated), and for each C.I.D. number the following information: dollars per semester, TLU's per semester, dollars per TLU, students per semester, dollars per student, weekly student contact hours per semester and dollars per weekly student contact hour (weekly student contact hour = number of students in a course x number of hours course meets per week). CCDETØ also separates this information within a given C.I.D. number into contract and hourly and computes an immediate total of contract and hourly for that C.I.D. number for that person of dollars, TLU's students and weekly student contact hours. CCDETØ also computes lower bounds of dollars, TLU's, students and weekly student contact hours for the contract, hourly and monthly (classified) groups within each major classification (same first two digits of C.I.D. number), however in the lower bound lines the amounts $/TLU, $ST and $/WSCH are not summations but quotients of summations.

The tape CCINTE contains 72-character records, each representing a line of the report CCDETØ, containing the following information: C.I.D. number, a character identifying the record as contract, hourly or monthly, and the associated dollars, TLU's, students and weekly student contact hours. It does not contain the quotients $/TLU, $/ST and $/WSCH as these can be calculated only after all records with the same C.I.D. number have been read.

In the program CCRDO4 the tape CCINTE is read and the information from the tape is stored in core before the program begins to calculate and then print the report CCSUMØ ("SUM" = Summary report). This is because not all C.I.D. numbers having the same first two digits occur in a group together, spurious ones exist due to teachers who teach a course

in another division. In order to save this information, the program stores all information until the tape has been completely read. The program then sums dollars, TLU's, students and weekly student contact hours and calculates $/TLU, $/ST, $/WSCH for each unique C.I.D. number, and separates contract, hourly and monthly information as the previous program does. It also calculates totals for each major classification (first two digits of C.I.D. number), then calculates for the totals the amounts $/TLU, $/ST, $/WSCH. These quotients are rather artificial as they represent an unweighted combination of contract and hourly data. The program then prints the report called CCSUMØ. It lists in ascending C.I.D. number order the above information. Program CCRDO4 is presently written to accept the actual C.I.D. numbers occurring in the college and if others occur or some are deleted (unlikely) the changes can easily be made in the program.

VI. Major Findings

The major findings are given in five tables and two appendices to this report. The tables contain the most general analysis, usually presented by C.I.D. cluster. The two appendices are the detailed computer-printout analysis of the same findings for each specific C.I.D number, the first showing costs for all C.I.D.'s (Appendix A), and the second a specific listing of all offerings under vocational programs, with an analysis of differential costs, by specific C.I.D. (appendix B).

A. Direct 213 Costs of Instruction, by C.I.D. Cluster

Table I presents the direct contract instructor salary costs of each C.I.D. cluster, the number of enrolled students, 213 cost per enrolled student, weekly student contact hours, and 213 costs per weekly student contact hour.

B. Instructional Activity Center District Budget Figures, All C.I.D. Clusters

Table II presents the analysis on the basis of which our estimate of direct instructional costs would be made to establish a constant for all C.I.D.'s. The analysis for the entire college showed that direct contract salary (213) costs accounted for 79.9% of the direct costs of instruction for all instructional C.I.D.'s. On this basis it was possible to estimate that an increase of 20.1% of the contract 213 costs of instruction would yield a reasonable institutional approximation of actual costs.

C. District Administration, Library, and Student Service Costs

Table III presents an analysis of the various indirect costs of the college, as reflected in per-pupil or per-weekly student contact hour costs. For this analysis, the total institutional load of WSCH and pupils was divided into the various categories of cost to derive a unit-cost estimate. For example, Pupil Personnel Services cost an average of $10.26 per student, or $3.19 per W.S.C.H. From this analysis, certain constant cost figures were derived which were assumed to operate with equal impact on all instructional activities of the college. Specifically, it was estimated on the basis that all indirect costs amounted to $36.47 per student, or $11.35 per W.S.C.H.

D. Total Direct and Indirect Instructional Costs, per WSCH, by C.I.D Cluster

Table IV presents an aggregate analysis of all costs associated with the direct instruction and all services associated with the operation of the various programs of the district that are supportive of the regular day, contract offerings of the college, including the costs of all activity centers not directly related to instruction. That portion directly attributable to the instructional activity centers is expressed in the column labeled "Direct/WSCH", with all other costs aggregated as a fixed constant of $11.35 per weekly student contact hour.

E. Comparison of Vocational and Non-Vocational Costs, by C.I.D. Cluster

Table V is essentially the heart of this study, along with the detailed analysis of the same data in Appendix B. For each C.I.D. cluster, the number of WSCH included as part of a vocational program were separately analyzed for cost against the non-vocational programs. In those instances where only one kind of instruction was included, no "differential" of costs was calculated. An overall estimate of the differential was made for the entire institution, with the result that vocational instruction costs appeared to be 1.48 to 1.00 higher than non-vocational, on the institutional average.

According to the concepts under which this study was developed, particularly with the use of a fixed percentage constant to estimate all non-213 costs directly related to instruction, the cost differential appears to be related to the relatively lower ratio of student contact hours in vocational instruction, typically because of the necessity of supervision and individualized instruction in vocational or occupational skills laboratories. This premise appears to be proven by the two exceptions to an excess differential in Table V. In C.I.D. cluster 0800, "Education," the costs of co-curricular physical education activities, including team sports for which athletes enrolled for college credit created a more concentrated supervision-instruction pattern than the Early Childhood Education program, some of which could be taught either in large lecture sections, or with high WSCH in field experience courses. Similarly, Technical Writing (C.I.D. cluster 1500) could be taught more economically than, for example, English 42, a developmental course requiring heavy faculty-student ratios.

The information in Table V is derived from the output of the computer programs developed to provide base line data for cost analysis. These data are indeed the building blocks, rather than the building itself, since C.I.D. numbers do not represent vocational programs, but only the units of instruction which may be aggregated into a program. Since the central focus of this research was to create a model for such a comprehensive analysis, a discussion of program analysis and cost-benefit analysis is appropriate.

VII. Toward Program Cost Analysis

The computer programs developed in this research project allow the uses to isolate, within the limits specified, the several activity centers of the operation of the college. Particularly since the revised state budgeting procedure will require the use of C.I.D. classifications in both budgeting and reporting, the specific applications of the model to program budgeting are expected to be substantial, but those instructional activities identified by specific C.I.D.'s are not "programs," they are merely program elements. The C.I.D.'s do not denominate "majors," but courses of instruction. In order to perform a comprehensive program cost analysis, each element in the program must be identified, and all costs accumulated into a total. To illustrate this procedure, two examples of program cost analysis will be considered: (1) Two-year state college liberal arts transfer, and; (2) automotive services.

TABLE I
Direct 213 Contract Costs of Instruction, by C.I.D. Cluster

C.I.D.	Title	213 Costs	Enrolled Students	$/ENR	WSCH	$/WSCH
400	Biological Science	57,040.25	1431	39.86	4617	12.35
500	Business	78,712.59	1003	78.47	3503	22.47
600	Communications	9,931.33	94	105.65	318	31.23
700	Comp. Sci.	8,820.73	67	131.65	210	42.00
800	Education	102,632.82	3664	28.01	9079	11.30
900	Engineering	64,088.58	911	70.34	3048	21.02
1000	Fine Arts	87,106.73	1693	51.45	5934	14.67
1100	Foreign Language	63,689.12	758	84.02	3649	17.45
1200	Health Services	76,037.61	467	162.82	3307	22.99
1500	Letters	160,191.36	2849	56.22	9361	17.11
1700	Math	44,174.02	1296	34.08	4340	10.17
1900	Physical Science	81,033.10	1391	58.25	4400	18.41
2000	Psychology	27,985.35	910	30.75	2004	13.96
2100	Public Affairs	14,643.37	406	36.06	1444	10.14
2200	Social Science	77,669.37	2451	31.68	6944	11.18
	Total All	953,756.33	19,391	49.18	62,158	15.34

TABLE II

Instructional Activity Center District Budget
Figures SBCC, 1971-72 all C.I.D. Cluster

Budget Category	Amount	%
220	$248,180	7.4%
290	169,166	5.1%
800	211,439	6.3%
213	2,674,875	79.9%
All other (240,590,731)	53,160	1.3%

TABLE III

Administrative, Library and Student Services Costs

	Contract	Monthly	Instr. Mater.	Operations Maintenance Replacement	Pers. Benefits	Total	$/ENR	$/WSCH
Library	25,944.70	31,551.00	10,159.00	1,345.00	7,092.50	76,092.00	2.92	.91
St. Pers.	124,907.75	106,494.43	12,201.50	655.00	23,131.00	267,389.68	10.26	3.19
Instruction	49,892.25	47,882.00	5,995.50	125.00	6,935.00	110,829.75	4.25	1.32
General Adminstration of District	31,838.50	218,387.78	66,464.50	98,657.50	80,091.00	495,439.28	19.02	5.92
Totals	232,583.20	404,315.21	94,820.50	100,782.50	117,249.50	949,750.71	36.47	11.35

TABLE IV

Total Direct and Indirect Instructional Costs, Per WSCH, By CID Cluster

C.I.D.	Title	Direct Costs	WSCH	Direct/WSCH	Indirect/WSCH	Total/WSCH
0400	Biological Sciences	71,492.00	6198	11.53	11.35	22.88
0500	Business	92,253.06	6586	14.01	11.35	25.36
0600	Communications	9,931.33	318	31.23	11.35	42.58
0700	Computer Science	14,668.72	895	16.39	11.35	27.74
0800	Education	116,340.82	9369	12.42	11.35	23.77
0900	Engineering	78,216.33	4504	17.37	11.35	28.72
1000	Fine Arts	98,663.98	7245	13.62	11.35	24.97
1100	Foreign Language	64,420.12	3854	16.71	11.35	28.06
1200	Health Service	86,544.34	4286	20.19	11.35	31.54
1500	Letters	171,887.35	11824	14.54	11.35	25.89
1700	Math	54,157.28	5649	9.59	11.35	20.94
1900	Physical Science	106,918.09	6728	15.89	11.35	27.24
2000	Psychology	29,910.60	2672	11.19	11.35	22.54
2100	Public Affairs	20,380.87	2584	7.89	11.35	19.24
2200	Social Science	91,847.37	1011	8.99	11.35	20.34
TOTAL		1,107,452.26	82,893	13.36	11.35	24.71

Table V
Comparison of Vocational vs Non-Vocational Costs, By C.I.D. Cluster

C.I.D. Cluster	Title	WSCH Voc.	WSCH Non-Voc.	Total $/WSCH Voc.	Total $/WSCH Non-Voc.	$/WSCH Differential
0400	Biological Sci.	Ø	6,198	Ø	$22.88	-
0500	Business	2,252	1,251	$37.00	33.92	+$3.08
0600	Communications	Ø	318	Ø	27.74	-
0700	Computer Sciences	174	36	65.26	45.03	+20.23
0800	Education	1,659	7,420	20.95	25.81	- 4.86
0900	Engineering	3,048	Ø	36.60	Ø	-
1000	Fine Arts	344	5,590	42.67	28.13	+14.54
1100	Foreign Language	Ø	3,854	Ø	28.06	-
1200	Health Services	3,307	Ø	38.96	Ø	-
1500	Letters	249	9,112	18.87	32.25	-13.38
1700	Math	90	4,250	34.68	20.88	+13.70
1900	Physical Sciences	129	4,251	48.31	32.78	+15.53
2000	Psychology	Ø	2,672	Ø	22.54	-
2100	Public Affairs	1,444	Ø	23.43	Ø	-
2200	Social Sciences	Ø	1,011	Ø	20.34	-
	TOTALS	12,696	45,963	$34.07	$23.02	$11.05

Ratio of Vocational costs to Non-Vocational costs: 1.48/1.00
Ratio of Vocational costs to total Instructional costs (all programs): 1.38/1.00

Tables VI and VII show the analysis of total costs and per WSCH costs for the two specimen programs, one strongly liberal arts and the other strongly vocational in nature. Although total program costs show the vocational program to be 1.61 to 1.00 in a ratio of expense to the general education program, the difference per WSCH was only $2.47, placing the cost ratio at 1.12 to 1.00. The use of WSCH rather than units of credit in Column 4 of each table is critical, since State apportionment is based on hours of attendance rather than on units attempted and completed. Although the vocational program total costs were 61% higher than the non-vocational, the Automotive Services major also attended a 43% greater portion of WSCH, and thus generated the basis for that much increased apportionment. Consequently, the most reasonable cost comparison is still the per WSCH program cost, not total cost.

Such program cost analyses as the two exemplified above may provide the basis for long-range resource requirements projections. If, for example, General Biology claimed 2.94% of all WSCH in Fall, 1971 and one assumed a linear projection to 1980 such that General Biology would continue to claim the same proportion of students, one could be fairly precise in estimating at current costs the resources needed to offer that instruction. Similarly, it would be possible to estimate on the basis of declared majors, the program load resource requirements in 5 or 10 years

VIII. Toward Cost Benefit Analysis

One further use of base-line data such as those generated by such a model as the one in use at Santa Barbara City College is in the area of cost-benefit analysis. Indeed, an experimental study to assess the impact of vocational testing upon retention of students, thus to increase measurable program outcomes, was included under this project, and is reported in Appendix C in its entirety.

Basically, the cost-benefit question is raised in the following way: Cost differentials are really of limited value unless we have an indication of what is purchased by certain expenditures; if one of the "benefits" of an expenditure is an achieving student (e.g., a student earning an A, B, or C in a course of study), then what are the "real" costs of instruction, as expressed in terms of the numbers or proportions of achieving students? For purposes of illustration alone, since attrition figures were available by college division, but not by C.I.D., the cost study was re-aggregated according to the traditionally defined instructional divisions. The results of a sample cost-benefit analysis appear as Table VIII.

Interestingly enough the two most productive divisions, as indicated by proportions of students earning A, B, or C grades, were Vocational-Technical and Health Occupations. The "benefit" indicator served to put the costs in clearer perspective, as, for example, Voc-Tech costs appeared higher aside from benefits, but were $16.40 lower when considered in terms of product or benefit. The experimental question in the research reported as Appendix C in this study was whether an expenditure per student of $6.00 for a standardized comprehensive battery of tests of vocational aptitude and interest would yield any benefit in the proportions of achieving students.

Table VI
Total Program Cost General Studies,
State College Transfer (Long Beach State), 62 units

Course	C.I.D.	$/WSCH	Total WSCH In Program	Total Direct Cost
English 1-2	1501	$20.43	6	$122.58
Speech 7	1506	27.06	3	81.18
Literature/Philos.	1500	20.55	3	61.65
History 7, 8	2205	13.96	6	83.76
Health Ed 1	0837	13.13	2	26.26
Psychology 1	2001	19.07	3	57.21
Soc. Sci. Elective	2200	13.43	6	80.58
Biology 1	0401	15.21	6	91.26
Physical Sci. 1,3	1902	33.90	6	203.40
Fine Arts Elective	1000	17.63	3	52.89
Math Elective	1700	12.22	3	36.66
Electives	-	24.71	17	420.07
P.E.	0835	13.78	8	110.24
Total Program Cost:			72	$1,427.74
Total Program Cost, per WSCH:		19.82		

Table VII
Total Program Costs, Automotive Services Major,
Two Year Degree Program (60 Units)

Course	C.I.D.	Direct $/WSCH	Total WSCH In Program	Total Direct Cost
English	1501	$20.43	6	$ 122.58
Health Ed. 1	0837	13.13	2	26.26
History 7	2205	13.96	3	41.88
Electives	-	24.71	17	420.07
P.E.	0835	13.78	8	110.24
Automotive	0947	23.51	67	$1,575.17
Total Program Cost:			103	$2,296.20

Total Program Cost per WSCH: $22.29

Table VIII
Per Student Total and Per Achieving Student Total Costs
(213 Contract Base) Clustered by SBCC Division
Actual, 1971

SBCC Division	Total Direct Costs	Total ENR	Direct $/ENR	% Achieving A B C Grades	Direct $/Achieving ENR
Business	$79,697.52	960	$83.02	69%	$120.39
English	158,698.87	2167	73.23	61%	120.04
Fine Arts	108,188.46	1804	59.97	67%	89.48
Foreign Language	76,490.63	758	100.91	64%	157.71
Health Occupations	91,321.16	467	195.55	85%	230.03
Physical Ed., Hlth. Ed.	115,170.49	3561	32.34	68%	47.57
Physical Sciences	101,869.05	1439	70.79	66%	107.23
Life Sciences	68,505.34	1431	47.87	72%	66.51
Mathematics	53,052.99	1296	40.93	51%	81.49
Social Science	149,950.38	3648	41.10	60%	68.50
Voc. Tech.	133,423.73	1860	71.75	79%	90.83
	$1,136,368.52	19,391	58.60	66%	$86.39

Table IX
Illustrative Data - Cost Benefit Analysis of Testing Experiment

Subject-Program	Enrolled Students	Direct $/ST.	% Ach.	Cost/Ach.	Experimental Cost/St.	% Exp. Ach.	Exp. Cost/Ach.
Secretarial Studies	79	$130.28	85%	$153.61	$136.28	93%	$140.99
Radiologic Technology	183	77.08	85%	90.42	83.08	93%	82.97
Auto Mechanics	88	189.95	85%	222.87	195.95	93%	203.85
Marine Technology	255	88.37	85%	103.85	94.37	93%	95.08

The finding was that achievement grades increased 7.80% under experimental conditions. In terms of costs, the analysis might be as in Table IX. As that table shows, if the experimental testing increased persistence 8% across the board for students in the four target programs, the cost would have increased six dollars per student, but the cost per achieving (benefitting) student would have been an average of $11.96 lower, almost twice the price of the test. Under such scrutiny, decisions concerning the use of additional cost strategies such as testing or counseling can be made and evaluated.

IX. A Final Note

In November, 1970, the CJCA Ad Hoc Committee on Program Budgeting made its report. In it, a chart showing the functions and characteristics of the PPB system was presented as a kind of preliminary goal statement for the implementation of such a system in the California Community Colleges. The chart is included on the following page.

The present study has constituted a preliminary attempt by one district to accomplish a model for categories I and II in the Table, and to illustrate the promise of the model for predicting future resource requirements and evaluating the achievement of program objectives and conducting cost-benefit analysis.

It is hoped that the sharing of the experience and resources of Santa Barbara City College through this study will be of value to other districts as they move toward full implementation of a more totally visible and accountable process of budgeting and reporting.

Table X

The Functions and Characteristics
of the PPB System in Approximate Order of Implementation

I. Defining and delimiting the activity center structure according to the organizational and authority structure of the institution

II. Collecting information relevant to each activity center
  A. Allocating historical costs
    1. Developing an accounting code
    2. Assigning direct costs
    3. Allocating indirect costs
  B. Assigning other relevant information
    1. Course information
    2. Staff information
    3. Student information
    4. Facilities information
  C. Determining administrative policies and guidelines
  D. Development of information formats
  E. Identifying instructional programs
  F. Establishing specific objectives for each program, the achievement of which can be analytically measured

III. Predicting future resource needs by program (II-F above need not be complete to make a prediction, unless a change in the current program is contemplated)
  A. An interim prediction technique
  B. Correlation analysis of relationships between programs, between program elements and between data elements
  C. Regression analysis based on (1) historical data, (2) correlated variables, and (3) assumptions regarding the institution's future

IV. Evaluation and control mechanisms
  A. Control of expenditures of resources
    1. By specific program
    2. By individual account within a program if desired
  B. Expenditure and revenue analysis, i.e., matching activity center expenditures with activity center revenue
  C. Evaluation of achievement of program objectives
  D. Cost-benefit analysis

Appendix A

CONTRACT 213 COSTS AND DIRECT INSTRUCTIONAL COSTS, By C.I.D.

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
BIOLOGICAL SCIENCES						
0401	General Biology					
	213 Contract	$30,843.33	726	$42.48	2436	$12.66
	Other Direct Costs	6,199.51				
	Total Direct Costs	37,042.84	726	51.02	2436	15.21
0402	General Botany					
	213 Contract	5,758.50	172	33.47	487	11.82
	Other Direct Costs	1,157.46				
	Total Direct Costs	6,915.96	172	40.21	487	14.20
0410	Physiology					
	213 Contract	10,508.40	228	46.08	837	12.55
	Other Direct Costs	2,112.19				
	Total Direct Costs	12,620.59	228	53.35	837	15.08
0411	Microbiology					
	213 Contract	2,175.63	102	21.32	248	8.77
	Other Direct Costs	437.30				
	Total Direct Costs	2,612.93	102	25.62	248	10.54
0418	Marine Biology					
	213 Contract	4,020.93	44	91.38	132	30.46
	Other Direct Costs	808.21				
	Total Direct Costs	4,829.14	44	109.75	132	36.58
0420	Ecology					
	213 Contract	3,733.46	159	23.48	477	7.82
	Other Direct Costs	750.42				
	Total Direct Costs	4,483.88	159	28.20	477	9.40
Totals Biological Sciences						
	213 Contract	57,040.25	1431	39.86	4617	12.35
	Other Direct Costs	11,465.09				
	Total Direct Costs	68,505.34	1431	47.87	4617	14.84

BUSINESS AND MANAGEMENT

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
0501	General Business and Commerce					
	213 Contract	$16,849.89	303	$55.61	934	$18.04
	Other Direct Costs	3,386.83	303			
	Total Direct Costs	20,236.72	303	66.78	934	21.67
0502	Accounting					
	213 Contract	9,139.48	122	74.91	488	18.72
	Other Direct Costs	1,837.03				
	Total Direct Costs	10,976.51	122	89.97	488	22.49
0506	Bus. Mgmnt and Admin.					
	213 Contract	1,772.40	46	38.53	138	12.48
	Other Direct Costs	356.25				
	Total Direct Costs	2,128.65	46	46.27	138	15.42
0508	Hotel, Restaurant Mgmnt					
	213 Contract	13,062.99	86	151.89	292	44.74
	Other Direct Costs	2,625.66				
	Total Direct Costs	15,688.65	86	182.43	292	53.73
0514	Secretarial Studies					
	213 Contract	8,569.51	79	108.47	317	27.03
	Other Direct Costs	1,722.47				
	Total Direct Costs	10,291.98	79	130.28	317	32.47
0534	General Merchandise					
	213 Contract	1,962.16	20	98.10	60	37.70
	Other Direct Costs	394.39				
	Total Direct Costs	2,356.55	20	117.83	60	39.27

BUSINESS AND MANAGEMENT (Continued)

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
0538	General Clerical					
	213 Contract	$1,894.28	27	$70.15	81	$23.38
	Other Direct Costs	380.75				
	Total Direct Costs	2,275.03	27	84.26	81	28.09
0540	Typing, Related Occupations					
	213 Contract	9,475.52	153	61.93	623	15.20
	Other Direct Costs	1,904.58				
	Total Direct Costs	11,380.10	153	74.38	623	18.27
0541	Foremanship					
	213 Contract	4,256.86	79	53.88	237	17.96
	Other Direct Costs	855.63				
	Total Direct Costs	5,112.49	79	64.71	237	21.57
0598	Business Work Experience					
	213 Contract	4,628.20	88	52.59	333	13.89
	Other Direct Costs	930.27				
	Total Direct Costs	5,558.47	88	63.16	333	16.69
Total Business and Management						
	213 Costs	71,611.29	1003	77.57	3503	22.21
	Other Direct Costs	14,393.86				
	Total Direct Costs	86,005.15	1003	93.16	3503	26.67

COMMUNICATIONS

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
0602	Journalism					
	213 Contract	$7,023.99	55	$127.70	201	$34.94
	Other Direct Costs	1,412.52				
	Total Direct Costs	8,436.51	55	153.39	201	41.97
0605	213 Contract	2,907.34	39	74.54	117	24.84
	Other Direct Costs	584.37				
	Total Direct Costs	3,941.71	39	89.53	117	29.84
Total Communications						
	213 Contract	9,931.33	94	105.65	318	31.23
	Other Direct Costs	1,996.89				
	Total Direct Costs	12,378.22	94	125.18	318	37.00

COMPUTER SCIENCES

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
0703	Data Processing					
	213 Contract	$2,929.13	28	$104.61	84	$34.87
	Other Direct Costs	588.75				
	Total Direct Costs	3,517.88	28	125.63	84	41.88
0704	Computer Programming					
	213 Contract	5,891.60	39	151.06	126	46.75
	Other Direct Costs	1,184.21				
	Total Direct Costs	7,075.81	39	181.43	126	56.16
Total Computer Sciences						
	213 Contract	8,820.73	67	131.65	210	42.02
	Other Direct Costs	1,772.96				
	Total Direct Costs	10,593.69	67	158.11	210	50.45

EDUCATION

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
0323	Pre-elementary Education					
	213 Contract	$6,719.81	98	$68.56	918	$7.32
	Other Direct Costs	1,350.68				
	Total Direct Costs	8,070.49	98	82.35	918	8.79
0835	Physical Education					
	213 Contract	73,746.67	2745	26.86	6426	11.47
	Other Direct Costs	14,823.08				
	Total Direct Costs	88,569.75	2745	32.26	6426	13.78
0837	Health Education					
	213 Contract	15,917.05	728	21.86	1456	10.93
	Other Direct Costs	3,199.33				
	Total Director Costs	19,116.38	728	21.86	1456	13.13
0851	Recreation Assistants					
	213 Contract	6,070.09	88	68.97	264	22.99
	Other Direct Costs	1,220.09				
	Total Direct Costs	7,290.18	88	82.84	264	27.61
0898	Education Work Experience					
	213 Contract	179.20	5	35.84	15	11.94
	Other Direct Costs	36.02				
	Total Direct Costs	215.22	5	43.04	15	14.35
Total Education						
	213 Contract	102,632.82	3664	28.01	9079	11.30
	Other Direct Costs	20,629.20				
	Total Direct Costs	123,262.02	3664	33.82	9079	13.5

ENGINEERING

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
0901	General Engineering					
	213 Contract	$4,631.85	48	$96.49	161	$28.76
	Other Direct Costs	931.00				
	Total Direct Costs	5,562.85	48	115.89	161	34.55
0933	Electronic Technology					
	213 Contract	5,100.78	34	150.02	141	36.17
	Other Direct Costs	1,025.26				
	Total Direct Costs	6,126.04	34	180.18	141	43.45
0934	Electronics					
	213 Contract	5,507.91	122	45.14	317	17.37
	Other Direct Costs	1,107.09				
	Total Direct Costs	6,615.00	122	54.22	317	20.87
0947	Auto Mechanics					
	213 Contract	13,918.23	88	158.16	711	19.57
	Other Direct Costs	2,797.56				
	Total Direct Costs	16,715.79	88	189.95	711	23.51
0952	Blueprint Reading					
	213 Contract	4,097.70	106	38.65	371	11.04
	Other Direct Costs	823.64				
	Total Direct Costs	4,921.34	106	46.43	371	13.26
0959	Maritime Occupations					
	213 Contract	18,763.61	255	73.58	712	26.35
	Other Direct Costs	3,771.48				
	Total Direct Costs	22,535.09	255	88.37	712	31.65

ENGINEERING (continued)

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
0998	Engineering Work Experience					
	213 Contract	$12,068.50	258	$46.77	635	$19.00
	Other Direct Costs	2,425.77				
	Total Direct Costs	14,494.27	258	56.18	635	22.82
Total Engineering						
	213 Contract	64,088.58	911	70.34	3048	21.02
	Other Direct Costs	12,881.80				
	Total Direct Costs	76,970.38	911	84.49	3048	25.25

FINE ARTS

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1002	Art (Performing)					
	213 Contract	$14,702.99	271	$54.25	1084	$13.56
	Other Direct Costs	2,955.30				
	Total Direct Costs	17,658.29	271	65.16	1084	16.29
1003	Art History, Appreciation					
	213 Contract	5,754.50	238	24.17	714	8.05
	Other Direct Costs	1,156.65				
	Total Direct Costs	6,911.15	238	29.04	714	9.68
1004	Music (Performing)					
	213 Contract	20,751.50	408	50.86	1153	17.99
	Other Direct Costs	4,171.05				
	Total Direct Costs	24,922.55	408	61.08	1153	21.61
1005	Music (Theory)					
	213 Contract	1,164.27	59	19.73	177	6.57
	Other Direct Costs	234.02				
	Total Direct Costs	1,632.29	59	27.66	177	9.22
1006	Music History, Appreciation					
	213 Contract	9,003.74	337	26.71	1011	8.90
	Other Direct Costs	1,809.75				
	Total Direct Costs	10,813.49	337	32.09	1011	10.69
1007	Dramatic Arts					
	213 Contract	19,575.99	208	94.11	1088	17.99
	Other Direct Costs	3,934.77				
	Total Direct Costs	23,510.76	208	113.03	1088	21.61

FINE ARTS (Continued)

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
	Photography					
1011	213 Contract	$7,181.99	71	$101.15	363	$19.78
	Other Direct Costs	1,443.58				
	Total Direct Costs	8,625.57		121.49	363	23.76
1030	Graphic Arts					
	213 Contract	8,495.75	87	97.65	297	28.60
	Other Direct Costs	1,707.76				
	Total Direct Costs	10,203.51	87	117.28	297	34.35
1098	Arts Work Experience					
	213 Contract	476.00	14	34.00	47	10.12
	Other Direct Costs	95.68				
	Total Direct Costs	571.68	14	40.83	47	12.16
Total Fine Arts						
	213 Contract	87,106.73	1693	51.45	5934	14.67
	Other Direct Costs	17,508.56				
	Total Direct Costs	104,615.29	1693	61.79	5934	17.63

FOREIGN LANGUAGE

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1102	French					
	213 Contract	$14,129.48	193	73.20	925	$15.27
	Other Direct Costs	2,840.02				
	Total Direct Costs	16,969.50	193	87.92	925	18.34
1103	German					
	213 Contract	13,454.02	135	99.65	647	20.79
	Other Direct Costs	2,704.26				
	Total Direct Costs	16,158.28	135	119.69	647	24.97
1105	Spanish					
	213 Contract	36,105.62	430	83.96	2077	17.38
	Other Direct Costs	7,257.23				
	Total Direct Costs	43,362.85	430	100.84	2077	20.88
Total Foreign Language						
	213 Contract	63,689.12	758	84.02	3649	17.45
	Other Direct Costs	12,801.51				
	Total Direct Costs	76,490.63	758	100.91	3649	20.96

HEALTH SERVICES

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1200	Health Services					
	213 Contract	$2,461.65	15	164.11	45	$54.70
	Other Direct Costs	494.79				
	Total Direct Costs	2,956.54	15	197.09	45	65.70
1203	Nursing					
	213 Contract	38,354.23	100	383.54	870	44.08
	Other Direct Costs	7,709.20				
	Total Direct Costs	46,063.43	100	460.63	870	52.95
1225	Radiologic Technology					
	213 Contract	11,744.41	183	64.17	839	13.99
	Other Direct Costs	2,360.63				
	Total Direct Costs	14,105.04	183	77.08	839	16.81
1230	Dental Assisting					
	213 Contract	5,883.49	52	113.14	390	15.08
	Other Direct Costs	1,182.58				
	Total Direct Costs	7,066.07	52	135.88	390	18.12
1238	Vocational Nursing					
	213 Contract	13,806.48	78	177.00	1014	13.61
	Other Direct Costs	2,775.10				
	Total Direct Costs	16,581.58	78	212.58	1014	16.35

HEALTH SERVICES (Continued)

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1244	Medical Assisting					
	213 Contract	$3,787.35	39	$97.11	149	$25.41
	Other Direct Costs	761.25				
	Total Direct Costs	4,548.60	39	116.63	149	30.53
Total Health Services						
	213 Contract	76,037.61	467	162.82	3307	22.99
	Other Direct Costs	15,283.55				
	Total Direct Costs	91,321.16	467	195.55	3307	27.61

LETTERS

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1501	General English					
	213 Contract	$80,671.11	1309	$61.62	4741	$17.01
	Other Direct Costs	16,214.89				
	Total Direct Costs	96,886.00	1309	74.01	4741	20.43
1502	Literature					
	213 Contract	37,145.95	698	53.21	2094	17.73
	Other Direct Costs	7,466.33				
	Total Direct Costs	44,612.28	698	63.91	2094	21.30
1506	Speech, Debate					
	213 Contract	19,129.00	283	67.59	849	22.53
	Other Direct Costs	3,844.93				
	Total Direct Costs	22,973.93	283	81.80	849	27.06
1507	Creative Writing					
	213 Contract	1,211.80	25	48.47	75	16.15
	Other Direct Costs	243.57				
	Total Direct Costs	1,455.37	25	58.21	75	19.40
1508	English as a Foreign Language					
	213 Contract	1,242.00	20	62.10	60	20.70
	Other Direct Costs	249.64				
	Total Direct Costs	1,491.64	20	74.58	60	24.86

LETTERS (Continued)

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1509	Philosophy					
	213 Contract	$15,616.20	423	$ 36.91	1269	$12.30
	Other Direct Costs	3,138.86				
	Total Direct Costs	18,755.06	423	44.34	1269	14.78
1510	Religious Studies					
	213 Contract	3,613.80	70	51.62	210	17.20
	Other Direct Costs	726.21				
	Total Direct Costs	4,304.01	70	61.48	210	20.49
1530	English - Reading					
	213 Contract	1,561.50	21	74.35	63	24.78
	Other Direct Costs	313.86				
	Total Direct Costs	1,875.36	21	89.30	63	29.77
Total Letters						
	213 Contract	160,191.36	2849	56.22	9361	17.11
	Other Direct Costs	32,198.29				
	Total Direct Costs	192,389.65	2849	67.53	9361	20.55

MATHEMATICS

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1701	General Mathematics					
	213 Contract	$38,959.00	1215	$32.06	4046	$9.63
	Other Direct Costs	7,830.76				
	Total Direct Costs	46,789.76	1215	38.51	4046	11.56
1702	Statistics					
	213 Contract	3,466.84	51	67.97	204	16.99
	Other Direct Costs	696.83				
	Total Direct Costs	4,163.67	51	95.30	204	23.82
1703	Applied Math					
	213 Contract	1,748.18	30	58.27	90	19.42
	Other Direct Costs	351.38				
	Total Direct Costs	2,099.56	30	69.98	90	23.33
Total Mathematics						
	213 Contract	44,174.02	1296	34.08	4340	10.17
	Other Direct Costs	8,878.97				
	Total Direct Costs	53,052.99	1296	40.93	4340	12.22

PHYSICAL SCIENCES

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1901	General Physical Sciences					
	213 Contract	$12,133.33	158	$76.67	474	$25.55
	Other Direct Costs	2,434.78				
	Total Direct Costs	14,548.11	158	92.08	474	30.69
1902	General Physics					
	213 Contract	26,137.29	292	89.51	926	28.23
	Other Direct Costs	5,253.59				
	Total Direct Costs	31,390.88	292	107.50	926	33.90
1905	General Chemistry					
	213 Contract	18,573.85	360	51.59	1287	14.43
	Other Direct Costs	3,733.34				
	Total Direct Costs	22,307.19	360	61.96	1287	17.33
1907	Organic Chemistry					
	213 Contract	3,113.14	61	51.03	183	17.01
	Other Direct Costs	625.74				
	Total Direct Costs	3,738.88	61	61.29	183	20.43
1914	Geology					
	213 Contract	14,189.36	349	40.65	1047	13.55
	Other Direct Costs	1,837.52				
	Total Direct Costs	16,026.88	349	45.92	1047	15.31
1917	Earth Sciences					
	213 Contract	2,885.79	61	47.30	153	18.86
	Other Direct Costs	580.04				
	Total Direct Costs	3,465.83	61	56.82	153	22

PHYSICAL SCIENCES (Continued)

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
1919	Oceanography					
	213 Contract	$4,020.34	110	$36.54	330	$12.18
	Other Direct Costs	808.09				
	Total Direct Costs	4,828.43	110	43.89	330	14.63
Total Physical Sciences						
	213 Contract	81,033.10	1391	58.25	4400	18.41
	Other Direct Costs	15,273.10				
	Total Direct Costs	96,306.20	1391	69.23	4400	21.89

PSYCHOLOGY

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
2001	Psychology					
	213 Contract	$26,606.95	659	$40.37	1676	$15.87
	Other Direct Costs	5,348.00				
	Total Direct Costs	31,954.95	659	48.49	1676	19.07
2005	Social Psychology					
	213 Contract	1,378.40	45	30.63	135	10.21
	Other Direct Costs	277.06				
	Total Direct Costs	1,655.46	45	36.79	135	12.26
Total Psychology						
	213 Contract	27,985.35	704	39.75	1811	15.45
	Other Direct Costs	5,625.06				
	Total Direct Costs	33,610.41	704	47.74	1811	18.56

PUBLIC AFFAIRS

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
2105	Law Enforcement					
	213 Contract	$9,529.19	180	$52.93	540	$17.64
	Other Direct Costs	1,915.37				
	Total Direct Costs	11,444.56	180	63.58	540	21.19
2198	Public Affair Work Experience					
	213 Contract	5,114.38	226	22.62	904	5.65
	Other Direct Costs	1,027.99				
	Total Direct Costs	6,142.37	226	27.18	904	6.79
Total Public Affairs						
	213 Contract	14,643.37	406	36.06	1444	10.14
	Other Direct Costs	2,943.36				
	Total Direct Costs	17,586.73	406	43.32	1444	12.18

SOCIAL SCIENCES

		$	Enrolled Students	$/ENR	WSCH	$/WSCH
2202	Anthropology					
	213 Contract	$5,191.32	201	$25.82	603	$8.60
	Other Direct Costs	1,043.45				
	Total Direct Costs	6,234.77	201	31.02	603	10.34
2203	Archaeology					
	213 Contract	1,880.40	86	21.86	258	7.28
	Other Direct Costs	377.96				
	Total Direct Costs	2,258.36	86	26.26	258	8.75
2204	Economics					
	213 Contract	6,721.50	129	52.10	387	17.36
	Other Direct Costs	1,351.02				
	Total Direct Costs	8,072.52	129	62.58	387	20.86
2205	History					
	213 Contract	27,128.61	895	30.31	2334	11.62
	Other Direct Costs	5,452.85				
	Total Direct Costs	32,581.46	895	36.40	2334	13.96
2206	Geography					
	213 Contract	4,047.40	61	66.35	183	22.11
	Other Direct Costs	813.53				
	Total Direct Costs	4,860.93	61	79.69	183	26.56
2207	Political Science					
	213 Contract	18,142.52	549	33.04	1589	11.41
	Other Direct Costs	3,646.65				
	Total Direct Costs	21,789.17	549	39.69	1589	13.71

SOCIAL SCIENCES (Continued)

		$	Students	$/ENR	WSCH	$/WSCH
2208	Sociology					
	213 Contract	$7,320.50	298	$24.56	894	$8.18
	Other Direct Costs	1,471.42				
	Total Direct Costs	8,791.92	298	29.50	894	9.83
2211	Afro-American Studies					
	213 Contract	4,181.64	100	41.81	300	13.93
	Other Direct Costs	840.50				
	Total Direct Costs	5,022.14	100	50.22	300	16.74
2213	Mexican American Studies					
	213 Contract	3,055.50	132	23.14	396	7.71
	Other Direct Costs	614.15				
	Total Direct Costs	3,669.65	132	27.80	396	9.27
Totals Social Science						
	213 Contract	77,669.37	2451	31.68	6944	11.18
	Other Direct Costs	15,611.53				
	Total Direct Costs	93,280.90	2451	38.05	6944	13.43

Appendix B

COMPARISON OF VOCATIONAL AND NON-VOCATIONAL PROGRAM COSTS, BY C.I.D. NUMBER AND CLUSTER, FALL, 1971 (CONTRACT STAFF)

	C.I.D. Category	213	Total Direct	WSCH	$/WSCH	Indirect/ WSCH	Total Cost/ WSCH
0501	Business and Commerce	8,059.38	9,679.23	318	30.43	11.35	41.78
0502	Accounting	9,139.48	10,976.51	488	22.49	11.35	33.84
0506	Bus. Mgment and Admin.	1,772.40	2,128.65	138	15.42	11.35	26.77
0508	Hotel Restaurant	13,062.99	15,688.65	292	53.73	11.35	65.08
0534	General Merchandise	1,962.16	2,356.55	60	39.27	11.35	50.62
0540	Typing, Related	9,475.52	11,380.10	623	18.27	11.35	29.62
0598	Business Work Exp.	4,628.20	5,558.47	333	16.69	11.35	28.04
	Total Vocational Programs (500)	48,100.13	57,768.16	2252	25.65	11.35	37.00
	Total Non-Vocational Programs (500)	23,511.16	28,236.99	1251	22.57	11.35	33.92
	Cost differential for Vocational Programs						+ 3.08

	C.I.D. Category	213	Total Direct	WSCH	$/WSCH	Indirect WSCH	Total Costs/ WSCH
0703	Data Processing	2,929.13	3,517.88	84	41.88	11.35	53.23
0704	Computer Programming	4,881.88	5,863.13	90	65.14	11.35	76.49
	Total Vocational Programs (700)	7,811.01	9,381.01	1.4	53.91	11.35	65.26
	Total Non-Vocational Programs (700)	1,009.72	1,212.67	36	33.68	11.35	45.03
	Cost Differential for Vocational Programs						+ 20.23

	C.I.D. Category	213	Total Direct	WSCH	$/WSCH	(Constant) Indirect/ WSCH	Total Cost/ WSCH
0823	Pre-Elementary Education	6,719.81	8,070.49	918	8.79	11.35	20.14
0837	Health Education	6,369.46	7,649.72	726	10.53	11.35	21.88
0898	Education Work Experience	179.20	215.22	15	14.35	11.35	25.70
	Total Vocational Program Costs (800)	13,268.47	15,935.43	1659	9.60	11.35	20.95
	Total Non-Vocational Program Costs (800)	89,364.35	107,326.59	7420	14.46	11.35	25.81
	Cost Differential for Vocational Programs						- 4.86

	C.I.D. Category	213	Total Direct	WSCH	$/WSCH	Indirect/ WSCH	Total Cost/ WSCH
0901	General Engineering	4,631.85	5,562.85	161	34.55	11.35	45.80
0933	Electronic Technology	5,100.78	6,126.04	141	43.45	11.35	54.80
0934	Electronics	5,507.91	6,615.00	317	20.87	11.35	32.22
0947	Auto Mechanics	13,918.23	16,715.79	711	23.51	11.35	34.86
0952	Blueprint Reading	4,097.70	4,921.34	371	13.26	11.35	24.61
0959	Maritime Occupations	18,763.61	22,535.09	712	31.65	11.35	43.00
0998	Engineering Work Exp.	12,068.50	14,494.27	635	22.82	11.35	34.17
	Total Vocational Program Costs (900)	64,088.58	76,970.38	3048	25.25	11.35	36.60
	Total Non-Vocational Program Costs (900)	Ø	Ø	Ø	Ø	Ø	Ø

	C.I.D. Category	213	Total Direct	WSCH	$/WSCH	Indirect/ WSCH	Total Cost/ WSCH
1030	Graphic Arts	8,495.75	10,203.51	297	34.35	11.35	45.70
1098	Arts Work Exp.	476.00	571.68	47	12.16	11.35	23.51
	Total Vocational Programs (1000)	8,971.75	10,775.19	344	31.32	11.35	42.67
	Total Non-Vocational Programs (1000)	78,134.98	93,840.10	5590	16.78	11.35	28.13
	Cost Differential for Vocational Programs						+ 14.54

	C.I.D. Category	213	Direct	WSCH	$/WSCH	Indirect/ WSCH	Total Cost/ WSCH
1200	Health Services	2,461.65	2,956.54	45	65.70	11.35	77.05
1203	Nursing	38,354.23	46,063.43	870	52.95	11.35	64.30
1225	Radiologic Technology	11,744.41	14,105.04	839	16.81	11.35	28.16
1230	Dental Assisting	5,883.49	7,066.07	390	18.12	11.35	29.47
1238	Vocational Nursing	13,806.48	16,581.58	1014	16.35	11.35	27.70
1244	Medical Assisting	3,787.35	4,548.60	149	30.53	11.35	41.88
Total Cost Vocational Programs (1200)		76,037.61	91,321.16	3307	27.61	11.35	38.96
Total Cost Non-Vocational Programs (1200)		Ø	Ø	Ø	Ø	Ø	Ø

	C.I.D. Category	213	Direct	WSCH	$/WSCH	Indirect/ WSCH	Total Cost/ WSCH
1500	General English (Technical)	1,559.75	1,873.25	249	7.52	11.35	18.87
	Total Cost Vocational Programs (1500)	1,559.75	1,873.25	249	7.52	11.35	18.87
	Total cost non-vocational programs (1500)	158,631.61	190,516.40	9112	20.90	11.35	32.25
	Cost Differential for Vocational programs						-13.38

	C.I.D. Category	213	Direct	WSCH	$/WSCH	Indirect WSCH	Total Cost/ WSCH
1703	Applied Math	1,748.18	2,099.56	90	23.33	11.35	34.68
	Total Cost Vocational Program (1700)	1,748.18	2,099.56	90	23.33	11.35	34.68
	Total Cost Non-Vocational Programs (1700)	42,425.84	50,953.43	4250	9.63	11.35	20.88
	Cost Differential for Vocational Programs (1700)						13.70

	C.I.D. Category	213	Direct	WSCH	$/WSCH	Indirect WSCH	Total Cost/ WSCH
1902	General Physics	3,970.15	4,768.15	129	36.96	11.35	48.31
	Total Cost Vocational Programs (1900)	3,970.15	4,768.15	129	36.96	11.35	48.31
	Total Cost Non-Vocational Programs (1900)	77,062.95	91,538.05	4271	21.43	11.35	32.78
	Cost Differential for Vocational Programs						+15.53

	C.I.D. Category	213	Direct	WSCH	$/WSCH	Indirect WSCH	Total Cost/ WSCH
2105	Law Enforcement	9,529.19	11,444.56	540	21.19	11.35	32.54
2198	Public Affairs W.E.	5,114.38	6,142.37	904	6.79	11.35	18.14
	Total Cost Vocational Programs (2100)	14,643.37	17,586.73	1444	12.18	11.35	23.43
	Total Non-Vocational Programs (2100)	Ø	Ø	Ø	Ø	Ø	Ø

Appendix C

SANTA BARBARA CITY COLLEGE

February 2, 1972

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Director
Research and Development

Office of Research Memo
2-72

THE USE OF A VOCATIONALLY-ORIENTED TEST BATTERY TO INCREASE STUDENT PERSISTENCE AND PERFORMANCE IN SELECTED CURRICULA

This research was partially funded by VEA, Part C funding, Project Number N-42-69294-C055-71

THE USE OF A VOCATIONALLY-ORIENTED TEST BATTERY TO INCREASE STUDENT PERSISTENCE AND PERFORMANCE IN SELECTED CURRICULA

Statement of the Problem

This study was conducted at Santa Barbara City College during the Fall semester, 1971, as one phase of a research project to ascertain costs (expenses) of various instructional activities in vocational and non-vocational subjects. The cost analysis aspect of the study was consistent with recently emerging interest from higher education in the applications of Program Budgeting techniques analysis of program costs and benefits. Recent papers by Heinkel (1970), and Wattenbarger, Cage and Arney (1970) have suggested that increased educational accountability in the community colleges, in the shape of more precise measures of costs and benefits, will be the rule rather than the exception in the decade of the 1970's.

That such accountability may include Pupil Personnel Services was illustrated by the publication in 1971 of Accountability in Pupil Personnel Services (Sullivan and O'Hare, 1971). Specifically aiming the appeal to pupil personnel professionals, the authors of the C.P.G.A. Monograph acknowledged in the first paragraph that "increasing pressure has been placed upon the schools in recent years to provide evidence that various educational programs, including programs in pupil personnel services, produce desirable changes in student performance." (Sullivan and O'Hare, 1971, p.1)

One specific focus of cost-benefit inquiry in the various possible counseling functions in community colleges is whether the use of standardized tests of educational aptitudes, occupational interest, or other evidences of opinions, attitudes and beliefs can be shown to have a measurable impact on student performance or persistence, when incorporated into a comprehensive program of pupil personnel services.

In 1970-71, Santa Barbara City College participated in the national development of norms for the Career Planning Profile, published by the American College Testing Company. (ACT, 1971) This comprehensive battery of tests, according to the publishers, "was developed to help young people consider a broad range of occupations and educational programs beyond high school." (ACT, 1971, p.1) Because of the wide range of information for counseling that the test provided, it appeared that the CPP might have value as an integral part of a comprehensive program of assessment, individual and group counseling, and career information services available at Santa Barbara City College.

To assess whether indeed the provision of CPP testing and interpretation services might have an impact on student performance and persistence in vocational programs, a research question was formulated in fairly broad terms: for comparable groups of students, enrolled in entry level courses for selected vocational programs in the Fall semesters 1970 and 1971, would the administration, group interpretation, and individual discussion of the Career Planning Profile improve student achievement and persistence if experimentally introduced during the Fall, 1971 semester?

Review of the Literature

David Tiedeman and Robert O'Hara (1963) have presented a model of career choice and adjustment which characterizes the counseling process as one of participation with the student in the processes of exploration, crystallization, choice and clarification of vocational and personal goals. The center of the process, according to Tiedeman, is the recognition of difference between where one now stands and where one would like to stand in terms of personal development. It is this difference, or what Festinger (1957) referred to as "cognitive dissonance," that provides the focus for counseling in some community colleges.

To elaborate briefly, and to relate the concept of "cognitive dissonance" to other concepts in "humanistic psychology," an article by Mayer and Cody (1968) provided a useful point of reference. In that article, "dissonance" was related to Rogers' (1951) notion of "incongruence". According to the authors, "incongruence and dissonance then seem to refer essentially to an intrapersonal mediating state during which an individual experiences contradictory perceptions either about himself or his environment . . . (Both Terms) suggest that the individual is, as a consequence, motivated to lessen the incompatibility of the perceptions or cognitions." (Mayer and Cody, 1968; 234) From the standpoint of the current study, students enrolled in the first course in a sequence of courses designed to provide specific preparation for occupational or career entry may be hypothesized to stand in a potential condition of cognitive dissonance or incongruence if they have been provided insufficient information about their own aptitudes interests or expectations to approach their training with confidence that they are both capable of competing with other students in the same courses and likely to be able to complete their educational objective.

On a related issued, Kester and MacMillan (1972) presented evidence that community college students are at least 1.3 times likelier to regard the counselor to be the most significant source of advice on school or job matters than they are to regard anyone else who may influence them, including their parents. The possibility that the counselor may be seen to provide an appropriate assistance strategy for resolving uncertainties about vocational education choices seems to be extremely reasonable in light of the evidence of over 50,000 responses from community college students.

On a more general level, in the literature, Max Raines (1963) suggested among the seven areas he outlined as appropriate for the concern of student personnel services the specific areas of Appraisal (educational testing) and Consultation (student counseling). At Santa Barbara City College, one commitment of student personnel is to provide the counselee with the opportunity to obtain sufficient data about his own interests, goals, achievements and aptitudes so that the issues of his personal and vocational choices can be seen against the background of meaningful evidence.

Very recently, Preising and Frost (1972) reported the results of a study at San Jose City College in which commercially available achievement motivation training materials were shown to have a significant impact upon the persistence of students in a special vocational retraining program. In that study, the participants, unemployed aerospace engineers, were confident of their knowledge

of performance skills, but had lost a clear sense of achievement motive from the extended period of unemployment which they had experienced. The relevance of that study to the current research is that the introduction of certain "artificial" information about themselves made significant differences in the persistence of students enrolled.

The brief review of the literature suggests that there is a theory of counseling within which the provision of specific information to students as they enter the process of career education is conceived to be entirely appropriate and specifically related to the resolution of "cognitive dissonance" between student aspirations and aptitudes, interests or beliefs. The role of the counselor, or at least the high visibility of the counselor as students seek advice on job or school matters has also been suggested. Finally, it has been shown that introducing carefully controlled information or training materials to students in vocational programs may have an impact on student persistence and performance.

Hypothesis

On the basis of the review of literature and local concerns, the following hypothesis was stated. In null form:

> H_0: The proportion of attrition and penalty grades awarded for experimentally treated students in the Fall, 1971 semester is not significantly lower than the proportion of attrition and penalty grades awarded to a control sample of students enrolled in the same courses in the Fall of 1970 ($P. < .05$) (W=attrition; D or F = penalty grades)

Because the benefit of the program of experimentally testing students, extensively reveiwing the results in groups, and referring students to counselors for further individual discussions would be deemed valuable only if it reduced the proportion of attrition and penalty grades, the alternative hypothesis for a one-tail test was selected:

> H_1: The proportion of attrition and penalty grades awarded under experimental conditions is significantly lower ($P. < .05$) than under control conditions.

Research Design and Procedures

Students enrolled in Automotive Engines (N=19), Marine Diving Technology 1 (N=48), Office Procedures (N=16) and Radiologic Technology 1 (N-21) were experimentally administered the ACT Career Planning Profile during the first week of the Fall, 1971 semester. At the time the tests were administered, students were assured that the purpose of the testing was to assist them in gaining enough information about their own interests, abilities and attitudes that they could confirm the decision they had made to enter the particular occupational training program they had selected. Since the testing had been funded under a VEA Part C Research grant, the students were also assured that they were to be provided the testing and consultation follow-up at no cost, although they were free not to participate if they so chose. No student refused to take the tests, although three were prevented from doing so because of illness.

When the results of the tests were received, the summary sheets provided by ACT were distributed to each class, and an extensive report on the general characteristics of the class on selected variables from the test was made. Each student was then encouraged to raise questions concerning his own scores in relation to the scores of the group, and in relation to national norms. The major counselor was in the room along with the testing officer during the group interpretation, and students were encouraged to make individual appointments with the counselor to discuss any concerns that may have been raised by the test. Throughout, it was stressed that the purpose of the testing was to provide a diagnostic point of reference against which the student could judge his own strengths and weaknesses. They were further assured that the college was most anxious to provide additional support services, tutoring, peer counseling or referral in order to assure that students could persist and achieve their academic goals.

As a comparison group, the records of students enrolled in the same classes during the Fall semester, 1970 were examined to ascertain the persistence and performance of students who had not been experimentally treated. (N=117)

Two possible sources of variance in the study were acknowledged: teacher difference from 1970 to 1971, and student difference in academic aptitude between comparison groups. To handle the first problem, programs were selected which were either taught by the same instructor for both the control and experimental periods, or in which a close working relationship had been established within a department or division. In two of the four classes, the instructor and the course content were identical. In the other two classes (Office Procedures and Radiologic Technology), the instructors had changed, but a close working relationship had been maintained, and course content was considered highly comparable by the staff.

The problem of comparability of the two groups was met by examining SCAT Total scores, the required entrance examination for all SBCC students, for a 10 per cent randomly selected sample of students from the experimental and control groups. A standard Z test statistic was calculated and no significant difference was found to exist between the two groups on measured academic aptitude. (See Table V below)

Findings

One aspect of the study was to provide descriptive data for each of the four programs. Tables I through IV show means for various measures of ability and interest for each of the groups, and indicates the performance of the 1971 samples in the various vocational classes. For each group of students, subtests from the CPP were selected that were assumed to be associated with enrollment and performance in the occupational area. Thus scores on "Mechanical Skills" were observed for the Automotive Engines, Marine Diving Technology, and Radiologic Technology students, but not for the Office Procedures group. In most cases, the national mean for the ACT norm sample was precisely at the 50th percentile for aptitude measures, or at a standard score of 50 for interest measures. For the sake of comparison, performance of each local group was compared with the total national sample of 16,841. Since the purpose of this comparison was to provide descriptive data only, no formal statistical comparisons were made between local and national samples. It was interesting to note, however, that for all local groups, the difference was pronounced in comparison to national performance on Reading Ability. For the Automotive, Marine Tech,

and Radiologic Tech groups, the range of difference was at a minimum of 40 percentile points above the national mean. Indeed, although the data are not presented in the tables, Reading Ability was a striking characteristic of the RT students: the local mean percentile rank was 99, with a standard deviation of 0! With the exception of the Office Procedures group, there appeared to be an observable difference between local and national means on the selected measures, to the favor of the local samples. This would tend to suggest that the selected measures might be further tested for validation as predictors of student achievement of these programs. Such a validation is, of course, beyond the scope of the current study.

The specific test of the hypothesis of this study must be understood in terms of the comparability of the two independent samples of students. As indicated earlier, instructor variance was partially controlled because in two of the four classes the instructors remained the same. For the other two classes, only one section was offered in each of the Fall semesters, and some effort was made to achieve consistency in course strategy and design.

The more important question of comparability lies with the student samples themselves. To ascertain this, SCAT-T scores were obtained for a randomly selected 10% sample of 1970 and 1971 students. The results in Table V show that the difference of 3.89 points in the mean score for the two groups was not statistically significant. There is thus some reason to believe that the two samples are comparable, both by academic aptitude and by course and instructor variables. The experimental variable of test administration, reporting, and consultation seems to have been sufficiently isolated to create some confidence in the findings.

Table VI presents the major finding of the study related to the null hypothesis that experimentally treated students would show no lower patterns of "penalty" grade than control students. For the one tail test, the critical value of Z is 1.64. The result of 1.950 is sufficient to reject the null hypothesis. In fact, there was a significantly lower proportion of penalty grades awarded under experimental conditions.

Conclusions and Implications

This study was primarily concerned with the question of whether introducing counseling information on aptitudes, interests and attitudes in a supportive environment of interpretation and counseling would positively influence the persistence and performance of students in selected vocational programs at Santa Barbara City College. The positive results of the study give rise to policy decisions, primarily whether the Career Planning Profile should be adopted and required of all entering students in vocational programs. On the basis of this study, it would appear that the use of such an instrument in the context and

fashion it was introduced experimentally, would have beneficial results. Among the other alternatives, however, it must be noted that Preising and Frost (1972) achieved similar findings through the use of commercially available achievement motivation training materials, as opposed to specific career aptitude or career information for individual students. On the broader scale, Kester and MacMillan (1972) reported that attrition rates for potential dropouts were cut in half through the use of a variety of student support services. The point is that each strategy for retaining students and increasing performance in various curricula must be weighed against costs of the various options. There is every cause to believe, however, that strategies for increasing such outputs in higher education are both available and demonstrably effective.

Table I
Ability, Interest and Performance
Measures for Automotive Engines
Students - Tested Fall, 1971

Ability Measures Observed	Mean Percentile Rank (N=19)	National Mean Percentile (N=16,841)
Mechanical Skills	67.94%ile	50.10%ile rank
Space Relations	63.95%ile	50.00%ile
Reading	98.00%ile	50.20%ile
Interest Measures Observed	**Standard Score (N=19)**	**Score (National) (N=16,841)**
"Technical-Mechanical"	60.89	50.60
"Technical-Electrical"	57.79	50.40
Performance Measures Observed	**N**	**Proportion of Sample**
Students Awarded A,B, or C grades Fall, 1971 (ACT Tested)	19	1.00

Table II
Ability, Interest and Performance Measures
for Marine Diving Technology Students
Tested Fall, 1971

Ability Measure Observed	Mean Percentile Rank (N=48)	National Mean Percentile (N=16,841)
Mechanical Skills	83.81%ile	50.10%ile
Non-Verbal Reasoning	75.75%ile	50.00%ile
Mathematical Reasoning	80.82%ile	49.90%ile
Reading Skills	91.20%ile	50.20%ile
Interest Measures Observed	**Mean Std. Score**	**National Mean Std. Score**
"Scientific"	59.32	50.10
"Technical-Mechanical"	58.41	50.60
"Technical-Electrical"	56.68	50.40
"Technical-Carpentry"	58.84	50.00
Performance Measures Observed	**N**	**Proportion of Sample**
A, B, or C Grades	46	.96
D, F, or W	2	.04

TABLE III
Ability, Interest and Performance Measures
for Office Procedures Students
Tested Fall, 1871

Ability Measures Observed	Mean Percentile Rank (N=16)	National Mean Percentile (16,841)
Clerical Skills	70.62%ile	50.10%ile
Numberical Computation	59,37%ile	50.10%ile
Reading	66.87%ile	50.20%ile

Interest Measures Observed	Mean Std. Score (N=16)	National Mean Std. Score
"Business-Contact"	53.75	50.00
"Business-Detail"	50.00	49.90
"Business-Mangement"	46.25	50.10

Perforance Measures Observed	N	Proportion of Sample
A,B, or C Grades	12	.75
D,F or W	4	.25

TABLE IV

Ability, Interest, and Performance Measures
for Radiologic Technology Students
Tested Fall, 1971

Ability Measures Observed	Mean Percentile Rank 8 (N=21)	National Mean Percentile (N=16,841)
Mechanical Skills	51.19%ile	50.10%ile
Non-Verbal Reasoning	61.19%ile	50.00%ile
Space Relations	40.72%ile	50.00%ile
Reading	99.00%ile	50.20%ile
Interest Measures Observed	**Mean Std. Score**	**National Mean Std. Score**
"Scientific"	55.95	50.10
"Health"	65.47	50.00
"Social Services"	57.38	49.90
"Technical-Electrical"	49125	50.40
Performance Measures Observed	**N**	**Proportion of Sample**
A,B, or C Grades	20	.95
D,F, or W	1	.05

TABLE V

Comparison of SCAT Total Scores,
1970 vs 1971 Samples
(10% Randomly drawn from
comparison groups)

Group	SCAT Total Mean	Standard Deviation
1970 Random Sample (N=12)	296.11	15.58
1971 Random Sample (N=11)	300.00	10.25

Difference: 3.89
Z = .586
Not Significant

TABLE VI

Comparison of Performance and Persistence
1970 Non-Tested vs. 1971 CPP Tested Samples
Selected Vocational Programs, SBCC

	ACT-CPP Tested 1971	Non-Tested 1970
A,B or C (Achievement) grades	97	100
D,F, or W grades (Penalty)	7	17
Percent "Achievement Grades" awarded	93.27%	85.47%
Percent "Penalty" Grades awarded	6.73%	14.53%

Diff: 7.80

Z= 1.950 (One tail test of H_o)

P. <.05

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THE USE OF A VOCATIONALLY-ORIENTED TEST BATTERY TO INCREASE STUDENT PERSISTENCE AND PERFORMANCE IN SELECTED CURRICULA

Statement of the Problem

This study was conducted at Santa Barbara City College during the Fall semester, 1971, as one phase of a research project to ascertain costs (expenses) of various instructional activities in vocational and non-vocational subjects. The cost analysis aspect of the study was consistent with recently emerging interest from higher education in the applications of Program Budgeting techniques to analysis of program costs and benefits. Recent papers by Heinkel (1970), and Wattenbarger, Cage and Arney (1970) have suggested that increased educational accountability in the community colleges, in the shape of more precise measures of costs and benefits, will be the rule rather than the exception in the decade of the 1970's.

That such accountability may include Pupil Personnel Services was illustrated by the publication in 1971 of Accountability in Pupil Personnel Services (Sullivan and O'Hare, 1971). Specifically aiming the appeal to pupil personnel professionals, the authors of the C.P.G.A. Monograph acknowledged in the first paragraph that "increasing pressure has been placed upon the schools in recent years to provide evidence that various educational programs, including programs in pupil personnel services, produce desirable changes in student performance." (Sullivan and O'Hare, 1971, p.1)

One specific focus of cost-benefit inquiry in the various possible counseling functions in community colleges is whether the use of standardized tests of educational aptitudes, occupational interest, or other evidences of opinions, attitudes and beliefs can be shown to have a measurable impact on student performance or persistence, when incorporated into a comprehensive program of pupil personnel services.

In 1970-71, Santa Barbara City College participated in the national development of norms for the Career Planning Profile, published by the American College Testing Company. (ACT, 1971) This comprehensive battery of tests, according to the publishers, "was developed to help young people consider a broad range of occupations and educational programs beyond high school." (ACT, 1971, p.1) Because of the wide range of information for counseling that the test provided, it appeared that the CPP might have value as an integral part of a comprehensive program of assessment, individual and group counseling, and career information services available at Santa Barbara City College.

To assess whether indeed the provision of CPP testing and interpretation services might have an impact on student performance and persistence in vocational programs, a research question was formulated in fairly broad terms: for comparable groups of students, enrolled in entry level courses for selected vocational programs in the Fall semesters 1970 and 1971, would the administration, group interpretation, and individual discussion of the Career Planning Profile improve student achievement and persistence if experimentally introduced during the Fall, 1971 semester?

Review of the Literature

David Tiedeman and Robert O'Hara (1963) have presented a model of career choice and adjustment which characterizes the counseling process as one of participation with the student in the processes of exploration, crystallization, choice and clarification of vocational and personal goals. The center of the process, according to Tiedeman, is the recognition of difference between where one now stands and where one would like to stand in terms of personal development. It is this difference, or what Festinger (1957) referred to as "cognitive dissonance," that provides the focus for counseling in some community colleges.

To elaborate briefly, and to relate the concept of "cognitive dissonance" to other concepts in "humanistic psychology," an article by Mayer and Cody (1968) provided a useful point of reference. In that article, "dissonance" was related to Rogers' (1951) notion of "incongruence". According to the authors, "incongruence and dissonance then seem to refer essentially to an intrapersonal mediating state during which an individual experiences contradictory perceptions either about himself or his environment . . . (Both Terms) suggest that the individual is, as a consequence, motivated to lessen the incompatibility of the perceptions or cognitions." (Mayer and Cody, 1968; 234) From the standpoint of the current study, students enrolled in the first course in a sequence of courses designed to provide specific preparation for occupational or career entry may be hypothesized to stand in a potential condition of cognitive dissonance or incongruence if they have been provided insufficient information about their own aptitudes interests or expectations to approach their training with confidence that they are both capable of competing with other students in the same courses and likely to be able to complete their educational objective.

On a related issued, Kester and MacMillan (1972) presented evidence that community college students are at least 1.3 times likelier to regard the counselor to be the most significant source of advice on school or job matters than they are to regard anyone else who may influence them, including their parents. The possibility that the counselor may be seen to provide an appropriate assistance strategy for resolving uncertainties about vocational education choices seems to be extremely reasonable in light of the evidence of over 50,000 responses from community college students.

On a more general level, in the literature, Max Raines (1963) suggested among the seven areas he outlined as appropriate for the concern of student personnel services the specific areas of Appraisal (educational testing) and Consultation (student counseling). At Santa Barbara City College, one commitment of student personnel is to provide the counselee with the opportunity to obtain sufficient data about his own interests, goals, achievements and aptitudes so that the issues of his personal and vocational choices can be seen against the background of meaningful evidence.

Very recently, Preising and Frost (1972) reported the results of a study at San Jose City College in which commercially available achievement motivation training materials were shown to have a significant impact upon the persistence of students in a special vocational retraining program. In that study, the participants, unemployed aerospace engineers, were confident of their knowledge

of performance skills, but had lost a clear sense of achievement motive from the extended period of unemployment which they had experienced. The relevance of that study to the current research is that the introduction of certain "artificial" information about themselves made significant differences in the persistence of students enrolled.

The brief review of the literature suggests that there is a theory of counseling within which the provision of specific information to students as they enter the process of career education is conceived to be entirely appropriate and specifically related to the resolution of "cognitive dissonance" between student aspirations and aptitudes, interests or beliefs. The role of the counselor, or at least the high visibility of the counselor as students seek advice on job or school matters has also been suggested. Finally, it has been shown that introducing carefully controlled information or training materials to students in vocational programs may have an impact on student persistence and performance.

Hypothesis

On the basis of the review of literature and local concerns, the following hypothesis was stated. In null form:

> H_0: The proportion of attrition and penalty grades awarded for experimentally treated students in the Fall, 1971 semester is not significantly lower than the proportion of attrition and penalty grades awarded to a control sample of students enrolled in the same courses in the Fall of 1970 ($P. < .05$) (W=attrition; D or F = penalty grades)

Because the benefit of the program of experimentally testing students, extensively reveiwing the results in groups, and referring students to counselors for further individual discussions would be deemed valuable only if it reduced the proportion of attrition and penalty grades, the alternative hypothesis for a one-tail test was selected:

> H_1: The proportion of attrition and penalty grades awarded under experimental conditions is significantly lower ($P. < .05$) than under control conditions.

Research Design and Procedures

Students enrolled in Automotive Engines (N=19), Marine Diving Technology 1 (N=48), Office Procedures (N=16) and Radiologic Technology 1 (N-21) were experimentally administered the ACT Career Planning Profile during the first week of the Fall, 1971 semester. At the time the tests were administered, students were assured that the purpose of the testing was to assist them in gaining enough information about their own interests, abilities and attitudes that they could confirm the decision they had made to enter the particular occupational training program they had selected. Since the testing had been funded under a VEA Part C Research grant, the students were also assured that they were to be provided the testing and consultation follow-up at no cost, although they were free not to participate if they so chose. No student refused to take the tests, although three were prevented from doing so because of illness.

When the results of the tests were received, the summary sheets provided by ACT were distributed to each class, and an extensive report on the general characteristics of the class on selected variables from the test was made. Each student was then encouraged to raise questions concerning his own scores in relation to the scores of the group, and in relation to national norms. The major counselor was in the room along with the testing officer during the group interpretation, and students were encouraged to make individual appointments with the counselor to discuss any concerns that may have been raised by the test. Throughout, it was stressed that the purpose of the testing was to provide a diagnostic point of reference against which the student could judge his own strengths and weaknesses. They were further assured that the college was most anxious to provide additional support services, tutoring, peer counseling or referral in order to assure that students could persist and achieve their academic goals.

As a comparison group, the records of students enrolled in the same classes during the Fall semester, 1970 were examined to ascertain the persistence and performance of students who had not been experimentally treated. (N=117)

Two possible sources of variance in the study were acknowledged: teacher difference from 1970 to 1971, and student difference in academic aptitude between comparison groups. To handle the first problem, programs were selected which were either taught by the same instructor for both the control and experimental periods, or in which a close working relationship had been established within a department or division. In two of the four classes, the instructor and the course content were identical. In the other two classes (Office Procedures and Radiologic Technology), the instructors had changed, but a close working relationship had been maintained, and course content was considered highly comparable by the staff.

The problem of comparability of the two groups was met by examining SCAT Total scores, the required entrance examination for all SBCC students, for a 10 per cent randomly selected sample of students from the experimental and control groups. A standard Z test statistic was calculated and no significant difference was found to exist between the two groups on measured academic aptitude. (See Table V below)

Findings

One aspect of the study was to provide descriptive data for each of the four programs. Tables I through IV show means for various measures of ability and interest for each of the groups, and indicates the performance of the 1971 samples in the various vocational classes. For each group of students, subtests from the CPP were selected that were assumed to be associated with enrollment and performance in the occupational area. Thus scores on "Mechanical Skills" were observed for the Automotive Engines, Marine Diving Technology, and Radiologic Technology students, but not for the Office Procedures group. In most cases, the national mean for the ACT norm sample was precisely at the 50th percentile for aptitude measures, or at a standard score of 50 for interest measures. For the sake of comparison, performance of each local group was compared with the total national sample of 16,841. Since the purpose of this comparison was to provide descriptive data only, no formal statistical comparisons were made between local and national samples. It was interesting to note, however, that for all local groups, the difference was pronounced in comparison to national performance on Reading Ability. For the Automotive, Marine Tech,

and Radiologic Tech groups, the range of difference was at a minimum of 40 percentile points above the national mean. Indeed, although the data are not presented in the tables, Reading Ability was a striking characteristic of the RT students: the local mean percentile rank was 99, with a standard deviation of 0! With the exception of the Office Procedures group, there appeared to be an observable difference between local and national means on the selected measures, to the favor of the local samples. This would tend to suggest that the selected measures might be further tested for validation as predictors of student achievement of these programs. Such a validation is, of course, beyond the scope of the current study.

The specific test of the hypothesis of this study must be understood in terms of the comparability of the two independent samples of students. As indicated earlier, instructor variance was partially controlled because in two of the four classes the instructors remained the same. For the other two classes, only one section was offered in each of the Fall semesters, and some effort was made to achieve consistency in course strategy and design.

The more important question of comparability lies with the student samples themselves. To ascertain this, SCAT-T scores were obtained for a randomly selected 10% sample of 1970 and 1971 students. The results in Table V show that the difference of 3.89 points in the mean score for the two groups was not statistically significant. There is thus some reason to believe that the two samples are comparable, both by academic aptitude and by course and instructor variables. The experimental variable of test administration, reporting, and consultation seems to have been sufficiently isolated to create some confidence in the findings.

Table VI presents the major finding of the study related to the null hypothesis that experimentally treated students would show no lower patterns of "penalty" grade than control students. For the one tail test, the critical value of Z is 1.64. The result of 1.950 is sufficient to reject the null hypothesis. In fact, there was a significantly lower proportion of penalty grades awarded under experimental conditions.

Conclusions and Implications

This study was primarily concerned with the question of whether introducing counseling information on aptitudes, interests and attitudes in a supportive environment of interpretation and counseling would positively influence the persistence and performance of students in selected vocational programs at Santa Barbara City College. The positive results of the study give rise to policy decisions, primarily whether the Career Planning Profile should be adopted and required of all entering students in vocational programs. On the basis of this study, it would appear that the use of such an instrument in the context and

fashion it was introduced experimentally, would have beneficial results. Among the other alternatives, however, it must be noted that Preising and Frost (1972) acheived similar findings through the use of commercially available achievement motivation training materials, as opposed to specific career aptitude or career information for individual students. On the broader scale, Kester and MacMillan (1972) reported that attrition rates for potential dropouts were cut in half through the use of a variety o. student support services. The point is that each strategy for retaining students and incresing performance in various curricula must be weighed against costs of the various options. There is every cause to believe, however, that strategies for increasing such outputs in higher education are both available and demonstrably effective.

Table I
Ability, Interest and Performance
Measures for Automotive Engines
Students - Tested Fall, 1971

Ability Measures Observed	Mean Percentile Rank (N=19)	National Mean Percentile (N=16,841)
Mechanical Skills	67.94%ile	50.10%ile rank
Space Relations	63.95%ile	50.00%ile
Reading	98.00%ile	50.20%ile
Interest Measures Observed	**Standard Score (N=19)**	**Score (National) (N=16,841)**
"Technical-Mechanical"	60.89	50.60
"Technical-Electrical"	57.79	50.40
Performance Measures Observed	**N**	**Proportion of Sample**
Students Awarded A,B, or C grades Fall, 1971 (ACT Tested)	19	1.00

Table II
Ability, Interest and Performance Measures
for Marine Diving Technology Students
Tested Fall, 1971

Ability Measure Observed	Mean Percentile Rank (N=48)	National Mean Percentile (N=16,841)
Mechanical Skills	83.81%ile	50.10%ile
Non-Verbal Reasoning	75.75%ile	50.00%ile
Mathematical Reasoning	80.82%ile	49.90%ile
Reading Skills	91.20%ile	50.20%ile
Interest Measures Observed	**Mean Std. Score**	**National Mean Std. Score**
"Scientific"	59.32	50.10
"Technical-Mechanical"	58.41	50.60
"Technical-Electrical"	56.68	50.40
"Technical-Carpentry"	58.84	50.00
Performance Measures Observed	**N**	**Proportion of Sample**
A, B, or C Grades	46	.96
D, F, or W	2	.04

TABLE III
Ability, Interest and Performance Measures
for Office Procedures Students
Tested Fall, 1871

Ability Measures Observed	Mean Percentile Rank (N=16)	National Mean Percentile (16,841)
Clerical Skills	70.62%ile	50.10%ile
Numberical Computation	59,37%ile	50.10%ile
Reading	66.87%ile	50.20%ile

Interest Measures Observed	Mean Std. Score (N=16)	National Mean Std. Score
"Business-Contact"	53.75	50.00
"Business-Detail"	50.00	49.90
"Business-Mangement"	46.25	50.10

Perfonance Measures Observed	N	Proportion of Sample
A,B, or C Grades	12	.75
D,F or W	4	.25

TABLE IV

Ability, Interest, and Performance Measures
for Radiologic Technology Students
Tested Fall, 1971

Ability Measures Observed	Mean Percentile Rank & (N=21)	National Mean Percentile (N=16,841)
Mechanical Skills	51.19%ile	50.10%ile
Non-Verbal Reasoning	61.19%ile	50.00%ile
Space Relations	40.72%ile	50.00%ile
Reading	99.00%ile	50.20%ile
Interest Measures Observed	**Mean Std. Score**	**National Mean Std. Score**
"Scientific"	55.95	50.10
"Health"	65.47	50.00
"Social Services"	57.38	49.90
"Technical-Electrical"	49125	50.40
Performance Measures Observed	**N**	**Proportion of Sample**
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TABLE V

Comparison of SCAT Total Scores,
1970 vs 1971 Samples
(10% Randomly drawn from
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