APPENDIX 2

THE UNIVERSITY OF WISCONSIN SYSTEM

Analysis Paper #13 October, 1975

AN INSTRUCTIONAL COST-PER-CREDIT METHODOLOGY:

AN ILLUSTRATED EXPLANATION

Interest in the development of a cost per credit of instruction rose to new levels during the latter 1960's and early 1970's as the concern for increased accountability in public higher education became a dominant theme. This interest in the potential use of cost-per-credit information was further intensified by more recent concern in the higher education community regarding academic program evaluation in a time of economic retrenchment.

In the University of Wisconsin System, a cost per credit of instruction was developed in 1969 and, since that time had been viewed largely in an experimental context, with several modifications being made in the methodology since its inception. Recently, however, the cost-per-credit calculations took on operational significance by serving as one, of several primary inputs into the computation of the Composite Support Index (see Analysis Paper #12 for further background on the CSI).

The purpose of this paper is to provide an understanding of the basic methodology leading to the calculation of cost per credit of instruction by student level within the University of Wisconsin System.

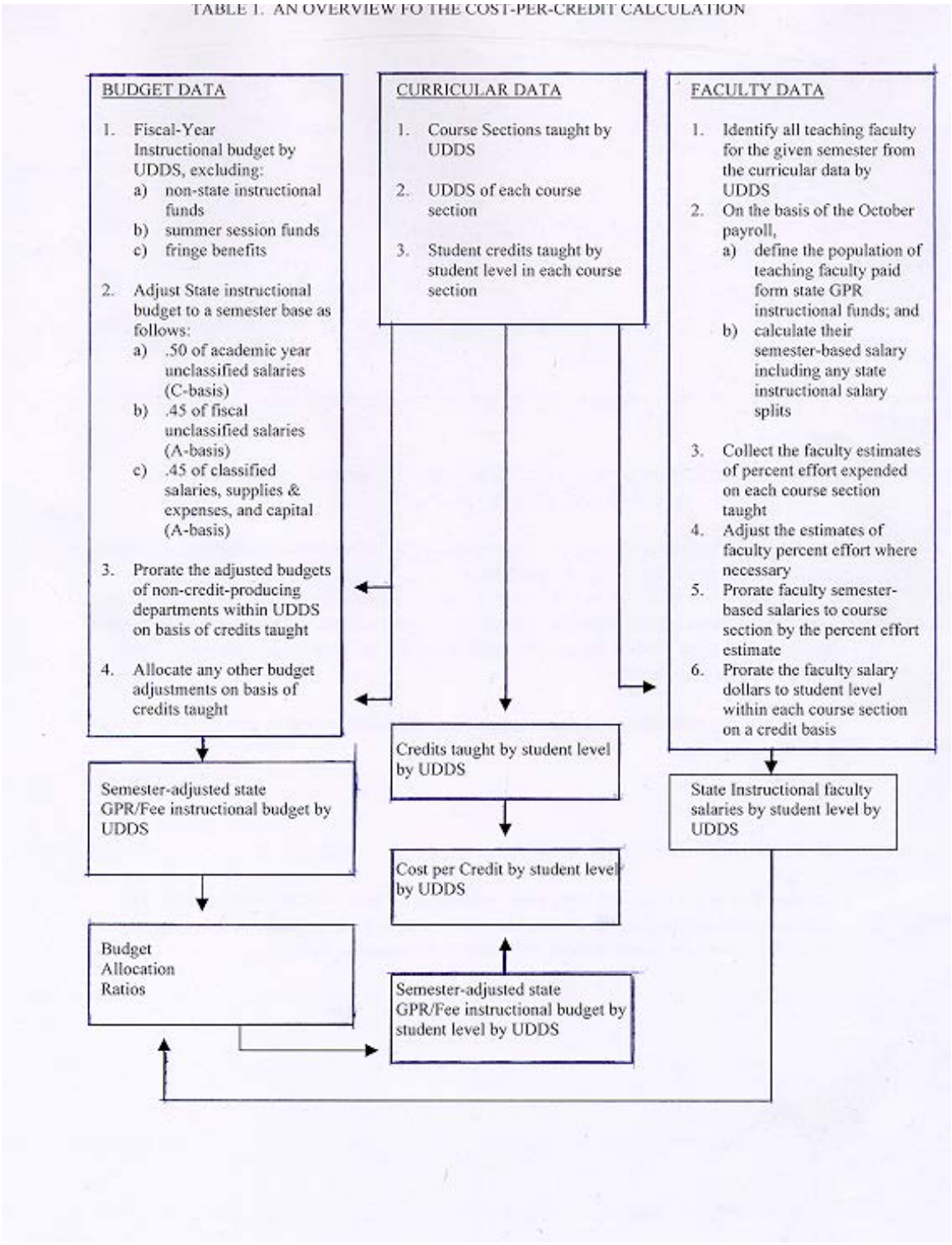
I. THE ORGANIZATIONAL CONTEXT

A cost per credit of instruction is calculated for each budgetary entity (normally a department) that engages in credit instruction within an institution. The cost per credit then is summarized by organizational/budgetary categories to OPA division (school or college), unit (institution) and cluster (University, Doctoral, Center) levels of aggregation. It also is summarized by academic disciplinary groupings, from-department to discipline areas (Social and Behavioral Sciences, Humanities, Engineering and Physical Sciences, Agriculture and Life Sciences, Health Sciences, Clinical Health), at the unit and cluster levels.

The discussion that follows is illustrated by moans of a hypothetical for example:

Unit: UW-Universe
Divisions College of Metaphysics
Department: Department of Mysteria.

TABLE 1. AN OVERVIEW FO THE COST-PER-CREDIT CALCULATION



II. THE DATA INPUTS

In order to calculate a departmental cost per credit of instruction by student level, the following components of information are required:

A. CURRICULAR DATA
- the number of credits taught by student level within each course section by UDDS

B. BUDGET DATA
- the state General Purpose Revenue/Fees instructional budget by UDDS

C. FACULTY DATA
- the total salary of each state-funded instructional faculty member by UDDS
- the percent of faculty effort expended on each course section of instruction by UDDS

The data in items in A and B will enable the calculation of a departmental cost-per-credit across all student levels of instruction. In order to arrive at a cost per credit by student level, it is necessary to allocate the departmental budget to the credits taught at each student level on the basis of related faculty effort. Thus, the data provided in Item C are essential. (See Table 1 for a more detailed outline of the primary data inputs to the cost per credit calculations).

Each of these required data components will be examined in greater detail in the next three sections.

III. REQUIRED CURRICULAR DATA

Curricular data are collected from each institution for each course section taught. The data collected are the number of student-credits taught in each course section, aggregated by student level. An illustration of such data is presented in Table 2.

TABLE 2. CURRICULAR DATA

Department: Mysteria
UDDS: Z-25-1000

COURSE-SECTIONS		Level of Student Credits I	II	III	TOTAL
General Astrology 101	Lee 1	207	3	0	
	Lee 2	234	6	0	240
	Lee 3	189	0	0	189
Basic Phrenology 203	Lee 1	126	24	0	150
	Lee 2	138	0	0	138
Techniques of Palmistry 205	Lee 1	90	0	0	90
	Lab 1	30	0	0	30
	Lab 2	30	0	0	30
Intro to Parapsychology 103	Lee 1	21	63	6	90
Elements of Telepathy 340	Lee 1	3	75	12	90
Small-Group Clairvoyance 560	Lee 1	0	21	39	60
Advanced Psychokinesis 690	Lee 1	0	0	33	33
Total		1,068	192	90	1,350

The curricular data is used to establish the population of credit- producing departments (or budgetary entities) within the institution to be used in developing a cost per credit of instruction. The number of credits taught by student level within each course section then is summarized by organizational/budgetary categories (by Unit-Division-Department-Subdepartment: UDDS) in a step preparatory to the calculation of a cost per credit of instruction.

IV. REQUIRED BUDGET DATA

The next required data input is the fiscal-year instructional budget by UDDS, excluding (1) non-state instructional funds, (2) summer session funds, and (3) fringe benefits. In addition, the budget is adjusted for any major change in status, such as merit increases or enrollment funding changes.

TABLE 3: BUDGET DATA SUMMARY

UNIT: UW-Universe

	Dept. Code	Fund-Act	Budget Total	Salaries			Fringe Benefits	Supplies & Expenses	Capital
				Academic	Classified	Total			
General Educational Administration	Z-01-1000	102-1*	$33,894	$14,700	$19,194	$33,894		$5,000	
College of	Z-25-1000	102-2	99,000	70,000	6,000	76,000		20,000	3,000
Metaphics		144-4*	12,000*	10,000		10,000			2,000
Mysteria		Total	111,000	80,000	6,000	86,000		20,000	5,000
Summer Session	Z-93-1000	102-2*	18,689*	18,689		18,689			
Unit-Wide Fringe Benefits (State-Funded)	Z-98-3000	102-2*	7,000*				$7,000		
Total Budget		102-1	38,894	14,700	19,194	33,894		5,000	
		102-2	124,689	88,689	6,000	94,689	7,000	20,000	3,000
		144-4	12,000	10,000		10,000			2,000
		Total	175,583	113,389	25,194	138,583	7,000	25,000	5,000

* Cost excluded from Cost-per-Credit Calculation

The state GPR instructional funds (minus the exceptions noted above) by UDDS then are converted to a semester basis. This requires adjusting the unclassified salaries, and the classified salaries, supplies and expenses, and capital for each UDDS.

Unclassified Salaries. First, unclassified salaries paid by state GPR instructional funds are adjusted by multiplying the unclassified salaries by .45 (for fiscal year unclassified salaries) or by .50 (for academic year unclassified salaries). The factor .45 is used to adjust annual salaries for summer session assignments, calculated as .1 of the total annual load. Table 4 provides an example of the budget detail for unclassified staff in an hypothetical department and illustrates the semester salary-adjustment factors.

TABLE 4. DETAIL (UNCLASSIFIED STAFF ONLY) FOR MYSTERIA (Z-25-1000)

Faculty IDENTIFICATION	RANK	Fund-	Pay ACTIVITY	BASIS	Semester SALARY	Semester FACTOR	SALARY
I.M. Magic	Professor	102-2	C	$10,000	.50		$5,000
		144-4*	C	10,000*			5,000*
				(20,000)			(10,000)
Harry O. Hand	Assoc Professor	102-2	C	18,000	.50		9,000
S.O. Mindly	Asst Professor	102-2	A	18,000	.45		8,100
Bright Starr	Asst Professor	102-2	C	16,000	.50		8,000
Group Position		102-2	C	8,000	.50		4,000

*Exclude from Cost-per-Credit Calculation

Classified salaries. The classified staff salaries, being annual salaries, are multiplied by .45, in converting them to a semester basis. This is done for each UDDS.

Supplies and expenses. Similarly, supplies and expenses paid out of state GPR instructional funds by UDDS are multiplied by .45 in order to obtain the semester-based amount.

Capital. The portion of the budget devoted to capital expenses also is adjusted to a semester basis by multiplying the capital expense portion of the budget by .45 for each UDDS.

Table 5 provides an example of a hypothetical department for which the budgeted costs pertinent to the calculation of the cost per credit of instruction have been adjusted to a semester basis.

TABLE 5. SEMESTER-BASED BUDGET FOR MYSTERIA (Z-25-1000)

		Salaries		Supplies &		
	Total	Academic	Classified	Total	Expenses	Capital
1. Budget (Fiscal Year)*	99,000	70,000	6,000	76,000	20,000	3,000
2. Semester Factor		.45 or .50 (See Table 4)	.45		.45	.45
3. Semester-Based Budget	47,150	34,100	2,700	36,800	9,000	1,350

- Includes only state GPR instructional funds

Having adjusted the state GPR instructional budgets by UDDS in the manner described above, the next step is to prorate the budgets of the non-credit-producing departments to the credit-producing departments. This step might be viewed as the pro-ration of non-teaching overhead.

Non-teaching overhead. Finally, the curricular data files containing the population of credit-producing departments (or budgetary entities) are used to identify the non-credit-producing departments. The adjusted state GPR instructional budgets of these non-credit-producing departments then are pro-rated to the credit-producing departments within UDDS on the basis of their portion of the total student credits taught. In addition, any major budget adjustments (such as merit increases or enrollment funding changes) are allocated to the credit-producing departments on the same credit-share basis.

The objective of the procedures described above is a semesterly state GPR/Fee instructional budget by category for each credit-producing UDDS.

V. REQUIRED FACULTY DATA

The third set of input data pertain to determining the population of teaching faculty and the percent effort they expend on the teaching of each course section. These data, in combination with the number of student credits taught per course section by student level, enable the calculation of state-funded faculty salary costs by student level for each course section. These calculations, when aggregated by student level across all course sections of instruction within each department, yield allocation ratios, which then are used in the final computation steps of the costs per credit of instruction by UDDS.

Each of these steps in preparing the faculty data input is examined below:

Teaching faculty. The first step is to identify all teaching faculty. This information is gained from the curricular files which indicate, for each course section taught, the instructor or instructors.

State-funded. Next, the task is to determine those teaching faculty who are paid from state GPR/Fee instructional funds. This is accomplished by turning to the October payroll and extracting the rank, full-time rate, pay basis, and percent FTE by UDDS and fund-activity codes for all unclassified staff paid wholly or partially from state GPR instructional-funds. This listing of state-funded faculty then is matched with the list of teaching faculty (gained from the curricular data), thereby defining the population of all teaching faculty paid wholly or partially from state GPR instructional funds.

The monthly salary for this population of teaching faculty then is annualized (multiplied by 9, 10, or 12 depending upon the pay basis) and reduced to a semester basis. This is achieved by multiplying the annualized-salary by .5 for academic-year faculty and by .45 for annual faculty. The factor .45 is used to adjust annual salaries for summer session assignments, calculated as .1 of the total annual load. Table 6 contains an illustration of the procedure by which the semester-based salary of the teaching faculty population is computed.

TABLE 6: FACULTY SALARY COMPUTATION
(PAYROLL INFORMATION)

Faculty Identification	Pay Basis	Fund/ Act	FTE	Monthly Salary	Adjustment Factor used to develop ratio	Annualized Salary	Semester Factor	Semester equivalent
Bright Starr	C	102-2	1.0	1,778	9	$16,000	.50	$8,000
Harry 0. Hand	C	102-2	1.0	2,000	9	18,000	.50	9,000
S. O. Mindly	A	102-2	1.0	1,500	12	18,000	.45	8,100
I. M. Magic	C	102-2	0.5	1,111	9	10,000*	.50	5,000*
		144-4	0.5	1,111	9	10,000 (20,000)	.50	5,000 (10,000)

* Professor Magic has a full-time appointment, however, 0.5 of his salary ($10,000 annually or $5,000 on a semester basis) is supported by federal research funds (144-4).

Faculty effort. Knowing the population of state-funded teaching faculty, each faculty member responsible for teaching one or more course sections reports the percent of effort expended on each course section on a full-term basis. The effort estimate is to represent a percent of the teaching faculty member's total University-related activities, regardless of the source of funds. (See data element #1150 in the Data Element Dictionary for a more complete definition of this element).

The next objective is to use the percent effort estimates to prorate the salaries of teaching faculty to each of the course sections taught. Before this can be done, however, the percent effort estimates must be adjusted in a certain instance; this instance is described below.

Percent effort adjustment. There are three basic conditions that can exist in the relationship between the total percent of effort expended by each faculty member in his/her course section(s) and his/her state-funded instructional salary: (l) the faculty member's salary is funded entirely from state GPR/Fee instructional funds; (2) the faculty member's salary is funded partially from state GPR/Fee instructional funds and that percent of state-funded pay is greater than or equal to the total percent of effort expended by the faculty member on all of his/her course sections; or, (3) the faculty member's salary is funded partially from state GPR instructional funds and that percent of state-funded pay is less than the total percent of effort reported by the faculty member on all of his/her course sections.

Depending upon which condition exists for each teaching faculty member paid wholly or partially from state GPR instructional funds, one of two procedures is followed in the pro-ration of state GPR instructional salary dollars to course sections by student level. Table 7 provides an example of a hypothetical department in which these three different conditions exist and illustrates the circumstances under which each of the two procedures is applied.

TABLE 7. FACULTY PERCENT EFFORT ADJUSTMENT

Condition 1

Faculty Identification	State-Instructional Funding Percent	Total Percent Effort	Adjusted Total Percent Effort
Bright Starr	100%[1]	80%[2]	80%

No adjustment of faculty percent effort required.

Condition 2

I. M. Magic	50%[1]	50%[2]	50%

No adjustment of faculty percent effort required.

Condition 3

I. M. Magic	50% [1]	75%[2]	50%

Assume the following faculty percent effort:

CLAI 560 Lec 1 30%
PSYC 690 Lec 1 45%

75% is greater than the 50% of I. M. Magic's salary which is funded from state-instructional funds.

The faculty percent of effort is adjusted for each section proportionately.

CLAI 560 Lec 1 = $^{30\%}/_{75\%}$ x 50% = 20%
PSYC 690 Lec 1 - $^{45\%}/_{75\%}$ x 50% = 30%

See Table 6
See Table 8

Under conditions #1 and 2, the same procedure is followed. In these instances, the faculty member's total salary (regardless of fund source) is multiplied by the percent of that faculty member's effort associated with each course section taught. This procedure provides the number of state-funded salary dollars devoted to the instruction of each course section.

Condition #3 presents a special situation. In this instance, the above procedure would be inappropriate since the dollar amount derived by multiplying the total salary by the percent of faculty effort by course section would result in a prorated salary amount in excess of the state GPR instructional portion of the faculty member's total salary. Consequently, the indicated percent of

effort estimates by course section are adjusted proportionately downward, using the state GPR instructional salary split of the total salary as the new base. This assures that the entire state-funded instructional portion of the total salary is prorated to the course sections and that it is prorated in the same proportionate manner as indicated by the original (unadjusted) faculty percent of effort estimates.

Pro-ration by student level. The net result of the above steps is the pro-ration of the state instructional salaries of teaching faculty to each of the course sections taught. The next step is to prorate these allocated salary dollars across the student levels within each course section. This is accomplished by distributing the salary dollars on the basis of the number of credits taught at each student level as a proportion of the total number of student credits taught in the course section.

TABLE 8. FACULTY SALARY ALLOCATION

Faculty Identification	Total Semester Salary	Course	Section	Percent Effort	Total Salary Allocation	Credit* Ratio I	Credit* Ratio II	Credit* Ratio III	Salary Allocation by Student Level I	Salary Allocation by Student Level II	Salary Allocation by Student Level III
I.M Magic	$10,000	CLAI 560	Lec 1	20	$2,000	--	0.3500	0.6500	$0	$700	$1,300
		PSYC 690	Lec 1	30	3,000	--	--	1.0000	0	0	3,000
Harry O. Hanc	9,000	PALM 205	Lec 1	35	3,150	1.0000	--	--	3,150	0	0
		PALM 205	Lab 1	15	1,350	1.0000	--	--	1,350	0	0
		PALM 205	Lab 2	15	1,350	1.0000	--	--	1,350	0	0
		ASTR 101	Lec 3	25	2,025	1.0000	--	--	2,250	0	0
S. O. Mindly	8,100	PARA 103	Lec 1	15	1,215	0.2333	0.7000	0.0667	283	851	81
		TELE 340	Lec 1	25	2,025	0.0333	0.8333	0.1334	68	1,687	270
Bright Starr	8,000	ASTR 101	Lec 1	20	1,600	0.9857	0.0143	--	1,577	23	0
		ASTR 101	Lec 2	20	1,600	0.9750	0.2500	--	1,560	40	0
		PHREN 203	Lec 1	20	1,600	0.8400	0.1600	--	1,344	256	0
		PHREN 203	Lec 2	20	1,600	1.0000	--	--	1,600	0	0
Total For Mysteria		(Z-25-1000)							$14,532	$3,557	$4,651

* See Table 2 for the credit by student level detail.

The final result of the above five steps is the semester-based state-funded salary cost by student level per course section taught. These salary costs then are aggregated to obtain the salary costs by student level by UDDS. Thus, to this point in the paper (and in the overall process), three basic data files have been created as input into the calculation of a cost per credit of instruction: (1) a curricular file containing the number of credits taught by student level by UDDS; (2) a budget file containing the adjusted state GPR instructional budget by UDDS; and (3) a salary file containing the faculty salary costs by student level by UDDS. (Refer to Table 1).

VI. BUDGET ALLOCATION RATIOS

The next major phase in the development of the cost per credit is the derivation of ratios by which the adjusted budget can be associated with the credits taught by student level by UDDS.

The ratios are obtained by calculating the state-funded instructional faculty salaries contained at each student level by UDDS as a proportion of the total state-funded instructional salary amount within each UDDS.

Next, the ratios are applied to the adjusted budget amounts by UDDS, re-suiting in the budgeted costs of instruction by student level by UDDS. Table 9 provides an example of the budget allocation ratio calculations and application.

TABLE 9: CALCULATION OF COST PER CREDIT - MYSTERIA (Z-25-1000)

		Student Level		
	Total	I	II	III
1. Faculty Instuctional Salaries (See Table 8)	22,740	14,532	3,557	4,651
2. Allocation Ratio	1.000	0.639	0.156	0.205
3. Semester-Based Budget (See Table 5)	47,150	30,129	7,355	9,666
4. Student Credits (See Table 2 Total)	1,350	1,068	192	90
5. Cost per Credit by UDDS (Line 3 + Line 4)	34.90	28.21	38.31	107.40

VII. COST PER CREDIT BY UDDS

The final step is to calculate the cost per credit of instruction by student level by UDDS. This is accomplished by dividing the state budgeted costs of instruction by student level by UDDS by the credits taught by student level by UDDS. Table 9 provides an illustration of this calculation step.

VIII. COST PER CREDIT BY DISCIPLINE CATEGORY

A cost per credit of instruction also is calculated for each of the six disciplinary areas noted at the beginning of the paper. This requires four additional steps.

Interdisciplinary UDDS. Each UDDS (except those in the Medical and Law Schools) is associated with one of six discipline areas: Social and Behavioral Sciences; Humanities; Engineering and Physical Sciences; Agricultural and Life Sciences; Health Sciences; and Clinical Health. Thus, the first step is to identify each UDDS with its appropriate discipline area. Those UDDS codes that cannot be associated with any one of the six discipline areas, due to their interdisciplinary nature, are placed in an interdisciplinary category.

Sum. The next step is to sum the credits and budget dollars by student level in each of the six discipline areas and in the interdisciplinary category.

Pro-ration ratios. Knowing the total credits taught and associated budget dollars by student level in each of the discipline areas, there is a need to prorate both the credits and budget dollars from the interdisciplinary category into the six discipline areas. In order to do this, ratios for prorating the credits and dollars must be established. These ratios are obtained by calculating the proportion of the credits taught by student level in each of the six discipline areas compared to the total credits taught by student level in the six discipline areas.

Then, the credits and budget dollars in the interdisciplinary category are prorated to the six discipline areas by student level on the basis of the ratios.

Calculation. The final step is to divide the budget dollars by the credits taught in each of the six discipline areas, thus arriving at a cost per credit of instruction by student level within each of the six discipline areas.

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This discussion provides an illustrated overview of how the cost per credit of instruction is calculated. Having completed this overview reference can be made to the diagrammatic summary of the entire process afforded by Table 1.