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ABSTRACT

The experiences are described of the University of Colorado institutional researcher in serving on a statewide task force charged with revising the student/faculty ratio guidelines that form the basis of the faculty funding formula. Following a description of the task force structure and procedures, the methodology employed in analyzing and developing student/faculty ratio guidelines is presented, including the use of spreadsheets developed on Lotus1-2-3 to the present and analyze Colora s student and faculty data and compare it with that of other states. Eight models developed to bring Colorado's student/faculty ratios in line with those of other states are described. The role conflicts experienced by an institutional researcher in this situation are also discussed. The impartial role of the institutional researcher was in conflict with the political demands and needs of various sectors of the higher education community, in that different models for developing ratios would allocate funds differently within the state. This role conflict was resolved by presenting data generated by each of the models to the task force. (KM)

Higher Education Funding: The Role of The Institutional Researcher in the Development of Student/Faculty Ratio Guidelines

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THE ROLE OF THE INSTITUTIONAL RESEARCHER

AIR

for Management Research, Policy Analysis, and Planning

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Teresa Karolewski
Chair and Editor
Forum Publications Editorial
Advisory Committee

Abstract

The Institutional Researcher at the University of Colorado system office served as a member of and staff person for a statewide task force charged with revising the student/faculty ratio guidelines that form the basis of the faculty funding formula. This paper discusses that process from two perspectives. First, the methodology employed in analyzing and developing student/faculty ratio guidelines will be presented, including Lotus data tables. Second, the role conflicts facing the Institutional Researcher will be explored, along with alternatives for alleviating that conflict.

Introduction: Objectives of Faculty Formula Funding

The faculty funding formula is a major element in a set of decision rules used in making resource allocations to public higher education institutions in Colorado. In Colorado, the General Assembly appropriates funds and the Colorado Commission on Higher Education (CCHE) provides fund allocations for the system of public higher education in the state. Any formula allocation of resources must reflect important commonalities among Colorado's public institutions, but must reflect significant differences as well. These differences include:

- o differences in campus enrollments, ranging from under 1,000 FTE to more than 20,000.
- o differences in role and mission, ranging from a vocational/technical emphasis at community colleges to a research emphasis at major research universities.
- o differences in student ability, with some institutions requiring only a high school diploma or GED for admission and others requiring demonstrated academic ability through class standing and test scores.
- o differences in program mix, with some institutions emphasizing the arts and sciences and others offering professional and technical education in a wide variety of vocations and professions.
- o differences in pedagogical style, ranging from extensive hands-on experience in nursing, welding, or music to large

lecture classes often used at major research universities.

- o differences in level of instruction, ranging from lower division to doctoral level.

Internally within institutions, the faculty formulas must provide appropriate and equitable support for programs and students in the institution. At the same time, each institution must have the flexibility to apply those resources in ways that make the most sense relative to the priorities of that institution.

Externally, faculty funding formulas should recognize that Colorado's public institutions compete nationally for faculty, staff, and students, as well as for contract and grant awards, other resources, and reputation. The faculty formulas, and the specific components of those formulas, should permit Colorado institutions to remain competitive in the higher education marketplace.

Background -- The History of Student-Faculty Ratio Guidelines in Colorado

In view of these considerations, the original Colorado faculty formulas had, from the beginning, the following primary objectives:

- o The approach must be simple and readily explainable;
- o It must permit diversity in programming and instructional styles;

- o It must reflect variations in student ability, preparation, and program preferences; and
- o It must encourage an equitable distribution of resources among institutions and programs.

More specifically, the student/faculty ratios that form the basis of the funding formula for resident instruction should:

- o Provide stability in funding while ensuring an adequate level or floor of support for individual institutions and public higher education as a whole. Colleges and universities experience a greater need for stability in funding than other social institutions because of the time required to establish programs, recruit faculty and staff, and produce student output.
- o Permit each discipline to meet the needs of students for instructional services, courses, and programs within reasonable parameters of size and faculty availability.
- o Recognize both similarities and differences among institutions or disciplines with respect to critical structural and pedagogical factors, such as economies of scale, teaching method, student needs, and differential costs by field of study and level of instruction.
- o Ensure an equitable distribution of available state resources by sector and by institution. This implies comparable funding for comparable disciplines or programs across institutions and sectors, but also implies an

allocation of resources that recognizes differences in higher education markets and missions.

- Combine a consideration of actual utilization patterns with normative considerations and a careful review of models employed in other states.

Taking these factors into account, as well as the evolution of new disciplines, teaching practices, and workload patterns, faculty formulas need to be reviewed and evaluated periodically and revised as necessary.

In 1976, the Association of Colorado Public College and University Presidents (APCUP) initiated a formula budgeting project to simplify and shorten the higher education budget process and develop a process for allocating resources which was both equitable and sensitive to differences in institutional roles and missions in Colorado. Development of a process for formula budgeting of faculty--including the original student/faculty ratios--was the first phase of the formula budgeting process. The ratios were based on actual faculty utilization patterns by level and discipline, and did not consider factors external to the state of Colorado. Altghough ratios were developed for 36 disciplines and 4 levels of instruction, they were summed to determine the total number of instructional faculty at an institution rather than the number of faculty assigned to particular disciplines. That institutional flexibility has been a cornerstone of the faculty budgeting process.

Goal of Current Restructuring of Student-Faculty Ratio Guidelines

As part of a current reexamination of the funding formula (called the Reexamination of the Base), several elements of the faculty funding formula are being reviewed, including the APCUP student-faculty ratios. A review of the ratios is appropriate at this time, for several reasons. First, the APCUP ratios have not been systematically reviewed since their inception ten years ago, and the review process offers a timely opportunity to ascertain their current appropriateness for individual disciplines, institutions, and sectors. Second, the ratios were developed in the mid-1970's, and the conditions of higher education funding have changed since that time, as well as faculty utilization patterns in some disciplines. Third, the original APCUP ratios were based entirely on factors internal to the state of Colorado, and since that time there has been a growing attention to external or peer comparisons as part of Colorado's funding process. Finally, several questions have arisen in the resource allocation process that relate directly to the APCUP ratios. For example, community colleges have raised concerns relating to the appropriateness of the ratios when applied to vocational/technical fields. The University of Colorado at Denver and Colorado Springs similarly believed that the ratios have resulted in funding levels that do not reflect their large graduate student proportions.

Task Force Structure

A task force consisting of official representatives from a variety of institutions and governing boards was established to review the APCUP ratios. The group was, at various times, augmented by representatives from the Colorado Commission on Higher Education (CCHE), other governing boards, the Reexamination of the Base Committee, and other representatives of the University of Colorado. This means that the recommendations of the Task Force, if accepted by the Reexamination of the Base Committee, would go to CCHE and be reflected in appropriations and resource allocations for higher education in the state.

Because of resources and expertise available at the University of Colorado, the Institutional Researcher acted as the primary staff person for the Task Force as well as the representative for the University of Colorado. This caused a significant role conflict for the Institutional Researcher emanating from two potentially conflicting responsibilities that were inherent in the position: objective research and advocate representation of the needs of the University of Colorado. This conflict will become more evident in the following discussion of process and methodology, and will be discussed more fully later in the paper.

Procedural Considerations

Assuming that a review of the APCUP ratios could lead to substantive revisions, a systematic approach required attention

to several procedural issues which are outlined separately below:

(1) What are actual faculty utilization patterns in Colorado by institution and sector, as well as for public higher education as a whole? Ratio guidelines should reflect actual Colorado experience, which may, for some disciplines, differ from patterns in other states due to funding priorities, administrative decisions, pedagogical innovation, or political realities. When the APCUP formulas were originally developed, it was deemed appropriate to base the ratios on actual patterns of practice in Colorado, not on a consideration of practices in other states. Table 1, derived from entering state budget document data into personal computer spreadsheets, shows actual faculty utilization patterns in Colorado by sector. The table illustrates, for a sample of Hegis fields, the number of FTE students in 1984-85, the number of FTE faculty, and the actual student-faculty ratio for each field and level of study. The table also shows the original APCUP student-faculty ratios and the ratio of actual FTE faculty to the number that would exist if the APCUP guidelines were applied strictly. Table 1 shows that the total actual student/faculty ratios across all fields and levels were very close to the APCUP guidelines, although there is some variation across sectors and disciplines. The most important finding in relation to research universities is that leaner ratios at the undergraduate level are being used to subsidize richer ratios at the graduate level.

TABLE 1

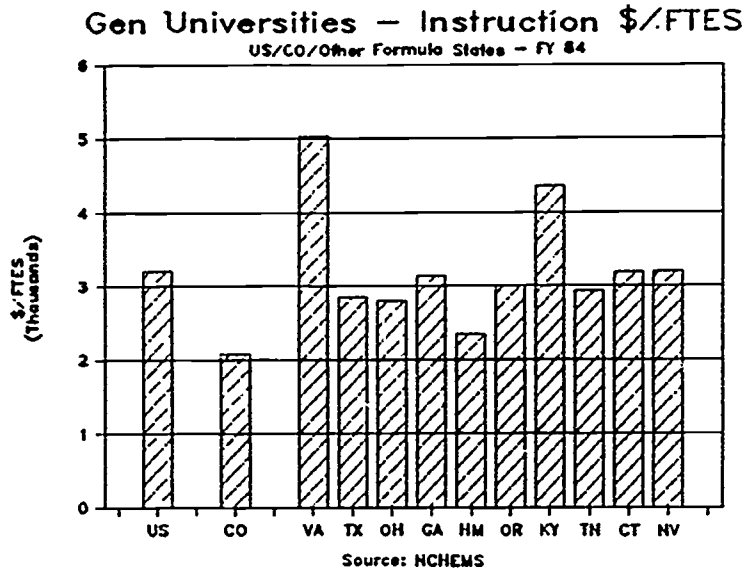
Student/Faculty Ratio Analysis
Summary of All Colorado Higher Ed Institutions
FY 84-85
(Does Not Include District Community Colleges)

	DOCTORAL INSTIT. Totals			NON-DOC. SENIOR INSTIT. Totals			COMMUNITY COLLEGE Totals			ALL INSTIT. COMBINED Totals			APCUP	Calc.	DIFF.	INDEX Act FTEF/
	FTES	FTEF	RATIO	FTES	FTEF	RATIO	FTES	FTEF	RATIO	FTES	FTEF	RATIO	RATIO	FTEF	FTEF	Calc FTEF
100.0 Agriculture																
0.4 Lower Level	291.6	15.70	18.57	49.2	4.56	10.79	77.4	3.96	19.56	418.2	24.22	17.27	24.00	17.43	6.79	1.39
0.5 Upper Level	502.0	36.01	13.94	10.5	1.23	8.54	0.0	0.00		512.5	37.24	13.76	15.00	34.17	3.07	1.09
0.6 Grad I	115.0	13.57	8.47	0.0	0.00		0.0	0.00		115.0	13.57	8.47	8.00	14.38	-0.80	0.94
0.7 Grad II	37.7	7.80	4.83	0.0	0.00		0.0	0.00		37.7	7.80	4.83	6.00	6.28	1.52	1.24
Total - Agriculture	946.3	73.08	12.95	59.7	5.79	10.31	77.4	3.96	19.56	1083.4	82.83	13.08	NA	72.25	10.58	1.15
200.0 Architecture																
0.4 Lower Level	163.1	9.63	16.94	0.0	0.00		1.2	0.10	11.80	164.3	9.73	16.88	20.00	8.21	1.52	1.18
0.5 Upper Level	155.0	12.35	12.55	15.8	2.60	6.08	0.0	0.00		170.8	14.95	11.42	15.00	11.39	3.56	1.31
0.6 Grad I	293.6	27.95	10.51	0.0	0.00		0.0	0.00		293.6	27.95	10.51	11.00	26.69	1.26	1.05
0.7 Grad II	0.0	0.00		0.0	0.00		0.0	0.00		0.0	0.00		7.00	0.00	0.00	
Total - Architecture	611.7	49.93	12.25	15.8	2.60	6.08	1.2	0.10	11.80	628.7	52.63	11.95	NA	46.29	6.34	1.14
300.0 Area Study																
0.4 Lower Level	2.6	0.10	26.00	156.6	7.70	20.34	3.6	0.10	36.30	162.8	7.90	20.61	30.00	5.43	2.47	1.46
0.5 Upper Level	15.7	2.08	7.55	25.9	1.40	18.50	0.0	0.00		41.6	3.48	11.95	22.00	1.89	1.59	1.84
0.6 Grad I	0.0	0.00		0.0	0.00		0.0	0.00		0.0	0.00		11.00	0.00	0.00	
0.7 Grad II	0.0	0.00		0.0	0.00		0.0	0.00		0.0	0.00		7.00	0.00	0.00	
Total - Area Study	18.3	2.18	8.39	182.5	9.10	20.05	3.6	0.10	36.30	204.4	11.38	17.96	NA	7.32	4.06	1.55
400.0 Biology																
0.4 Lower Level	1333.2	53.88	24.74	881.1	28.86	30.53	434.5	18.23	23.84	2648.9	100.97	26.23	25.00	105.95	-4.98	0.95
0.5 Upper Level	1196.9	84.87	14.10	259.6	21.93	11.84	0.0	0.00		1456.5	106.80	13.64	15.00	97.10	9.70	1.10
0.6 Grad I	165.5	37.79	4.38	4.0	1.03	3.88	0.0	0.00		169.5	38.82	4.37	8.00	21.19	17.63	1.83
0.7 Grad II	129.9	29.87	4.35	0.0	0.00		0.0	0.00		129.9	29.87	4.35	6.00	21.65	8.23	1.38
Total - Biology	2825.5	206.41	13.69	1144.7	51.82	22.09	434.5	18.23	23.84	4404.7	276.46	15.93	NA	245.89	30.57	1.12
500.0 Business																
0.4 Lower Level	1407.7	34.25	41.10	1790.7	50.89	35.19	274.0	11.45	23.93	3472.4	96.59	35.95	26.00	133.55	-36.96	0.72
0.5 Upper Level	3676.1	155.02	23.71	2383.0	104.28	22.85	0.0	0.00		6059.1	259.30	23.37	22.00	275.41	-16.11	0.94
0.6 Grad I	743.7	58.17	12.79	30.1	3.07	9.80	0.0	0.00		773.8	61.1	12.64	12.00	64.49	-3.25	0.95
0.7 Grad II	35.8	10.68	3.35	0.0	0.00		0.0	0.00		35.8	10.68	3.35	10.00	3.58	7.10	2.98
Total - Business	5963.3	258.12	22.72	4203.8	158.24	26.57	274.0	11.45	23.93	10341.1	427.81	24.17	NA	477.03	-49.22	0.90
600.0 Communications																
0.4 Lower Level	652.8	18.83	34.67	577.0	26.39	21.86	281.1	12.99	21.64	1510.9	58.21	25.96	21.00	71.95	-13.74	0.81
0.5 Upper Level	680.4	38.57	17.64	224.4	16.43	13.66	0.0	0.00		904.8	55.00	16.45	17.00	53.22	1.78	1.03
0.6 Grad I	32.3	5.28	6.12	7.0	1.75	4.00	0.0	0.00		39.3	7.03	5.59	12.00	3.28	3.75	2.15
0.7 Grad II	11.7	3.02	3.88	0.0	0.00		0.0	0.00		11.7	3.02	3.88	10.00	1.17	1.85	2.58
Total - Communications	1377.2	65.70	20.96	808.4	44.57	18.14	281.1	12.99	21.64	2466.7	123.26	20.01	NA	129.62	-6.36	0.95
700.0 Computer Science																
0.4 Lower Level	1454.8	51.29	28.36	745.8	27.31	27.31	539.1	25.27	21.33	2739.7	103.87	26.38	22.00	124.53	-20.66	0.83
0.5 Upper Level	665.5	38.16	17.44	467.8	25.33	18.47	0.0	0.00		1133.3	63.49	17.85	12.00	94.44	-30.95	0.67
0.6 Grad I	221.3	26.16	8.46	4.4	0.24	18.33	0.0	0.00		225.7	26.40	8.55	8.00	28.22	-1.82	0.94
0.7 Grad II	13.6	6.08	2.24	0.0	0.00		0.0	0.00		13.6	6.08	2.24	6.00	2.27	3.81	2.68
Total - Computer Sci.	2355.3	121.69	19.35	1218.0	52.88	23.03	539.1	25.27	21.33	4112.4	199.84	20.58	NA	249.46	-49.62	0.80

(2) What normative considerations must be taken into account in ensuring that the ratio guidelines are reasonable and equitable? Ratios for individual disciplines must have some degree of face validity while also reflecting actual utilization patterns. This element of ratio-setting was not given high priority in the process, as institutions are given flexibility in allocating FTE faculty internally within the confines of total FTE faculty guidelines under the new ratios.

(3) How does Colorado compare to other states in terms of the ratios that comprise the base of the faculty funding formula? It is reasonable to assume that Colorado should compare similarly with other states having similar funding situations if it is to remain competitive with respect to salaries, recruitment, and program offerings. A nationwide survey was conducted to determine which states utilize student-faculty ratios (or student credit hour/faculty ratios) as part of their funding formulas. Ten states were selected because they do, in fact, use such ratios, and do not appear to be too different from Colorado in terms of instructional expenditures per FTE student and education and general revenues per FTE student. Colorado ranks below most states on both indices, at least at the four-year degree level (see Figures 1 and 2). It is clear that the states in the model, however, while usually better funded than Colorado, are not among the national leaders in funding. Consequently, Colorado would not be out of line in seeking to get closer to the median faculty

Fig. 1
Comparison of Instructional Dollars per FTE Student and Educational & General Dollars per FTE Student for General 4-year Universities



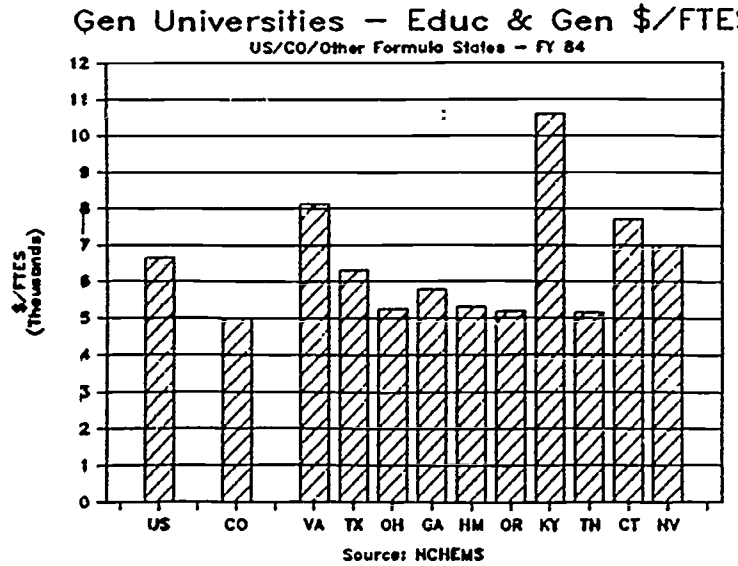
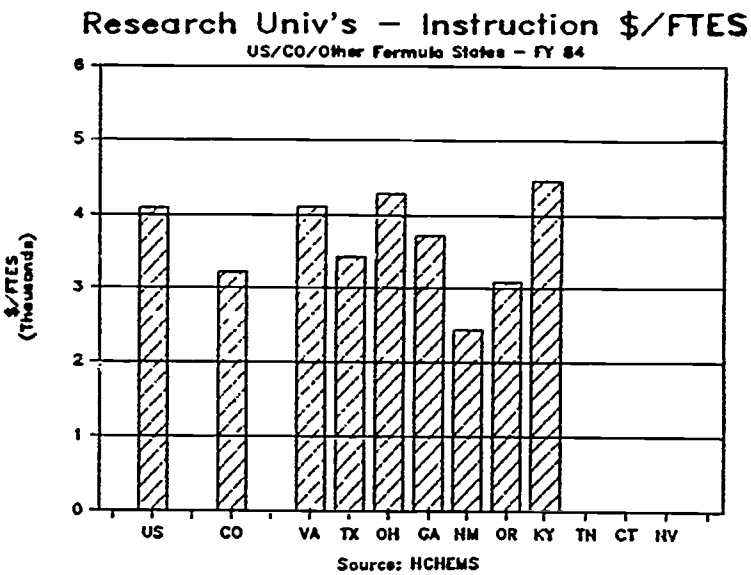
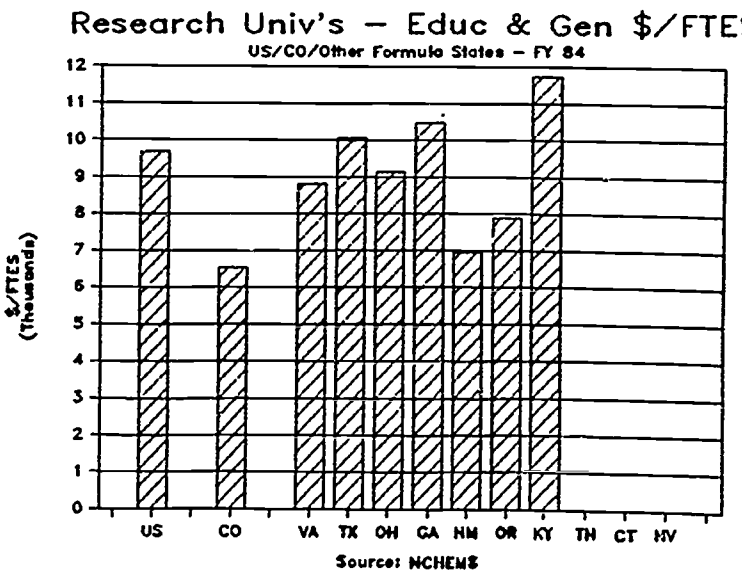


Fig. 2
Comparison of Instructional Dollars per FTE Student and Educational & General Dollars per FTE Student for Research Universities





funding level of those states.

Because most states use a different definition of a full-time equivalent student than Colorado (particularly at the graduate level), the student/faculty ratios for other states were converted to Colorado equivalents using Colorado's definition of an FTE student. A comparison of those equivalents showed that the ratios in Colorado were much leaner than the ratios used in other states. Table 2 summarizes the number of FTE faculty that would result from applying Colorado's definition of an FTE student to the student/faculty ratio guidelines employed in other states. As the table shows, the ratios used in most of the other states in the model would result in considerably more FTE faculty for Colorado if Colorado's student FTE definition were applied to the ratios used in other states. Spreadsheet programs were subsequently used to calculate the number of additional FTE faculty that would result at each Colorado institution if other states' ratios were applied to actual FTE student enrollments at that institution.

The table clearly demonstrates that the ratios used in other states result in higher levels of faculty funding than Colorado's APCUP ratios. For traditional academic disciplines at the lower and upper undergraduate levels, the median ratios for other states would result in 22 percent more FTE faculty than Colorado's ratios allow. At the graduate levels the discrepancy is even greater: the median grad I ratios provide for 36 percent

TOTALS

TABLE 2
IMPACT OF APPLYING OTHER STATES' GUIDELINES
TO COLORADO ENROLLMENTS
(ALL RATIOS CONVERTED TO COLORADO FTES DEFINITION)
BY DISCIPLINE GROUP

	LEVEL 0-4900					LEVEL 5000 +					COMBINED				
	LOWER	UPPER	GRAD I	GRAD II	TOTALS	LOWER	UPPER	GRAD I	GRAD II	TOTALS	LOWER	UPPER	GRAD I	GRAD II	TOTALS
COLORADO	2231.97	1875.77	603.56	248.74	4960.03	789.78	12.49			802.27	3021.75	1888.26	603.56	248.74	5762.30
VIRGINA	2717.95	2397.37	908.81	301.00	6325.13	700.91				700.91	3418.87	2397.37	908.81	301.00	7026.04
TEXAS	2712.15	1652.72	763.53	495.02	5623.41	974.11				974.11	3686.26	1652.72	763.53	495.02	6597.52
TENN	2985.44	2418.33	913.31	497.87	6814.96	606.52				606.52	3591.97	2418.33	913.31	497.87	7421.48
OHIO	2695.46	2283.14	502.05	215.52	5696.18	698.45	11.01			709.46	3393.91	2294.16	502.05	215.52	6405.64
GEORGIA	1992.73	1526.11	1067.03	311.02	4896.88	457.41	9.46			466.87	2450.13	1535.57	1067.03	311.02	5363.75
N MEXICO	2539.01	1900.66	820.70	259.58	5519.94										
OREGON	2947.47	2571.04	820.65	352.80	6691.96										
NEVADA	2617.05	1558.48	594.90	166.95	4937.38	665.19				665.19	3282.24	1559.30	594.90	166.95	5802.57
KENTUCKY	3016.76	2382.43	824.51	532.38	6756.08	1062.28				1062.28	4079.04	2382.43	824.51	532.38	7818.36
CONN	2894.32	2290.39	739.07	275.45	6199.22	998.23				998.23	3892.55	2290.39	739.07	275.45	7197.45
MEAN	2711.83	2098.07	795.46	340.76	5725.56	770.39	10.24			691.57	3474.37	2066.28	789.15	349.40	6402.84
INDEX (MEAN/CO)	1.21	1.12	1.32	1.37	1.15	0.98	0.82			0.86	1.15	1.09	1.31	1.40	1.11
MEDIAN	2715.05	2286.77	820.68	306.01	6814.96	837.51	10.24			606.52	3639.11	2338.29	824.51	311.02	6913.56
INDEX (MEDIAN/CO)	1.22	1.22	1.36	1.23	1.37	1.06	0.82			0.76	1.20	1.24	1.37	1.25	1.20

more faculty members than Colorado's ratios, and the median grad II ratios provide for 23 percent more. This pattern is reversed for vocational/technical disciplines, where Colorado's current ratios are richer than the ratios for other states.

Development of Models

Brainstorming sessions were held among Task Force members and at the University of Colorado to develop several models that would bring Colorado's student/faculty ratios more in line with the ratios utilized in other states and permit reasonable increases in appropriations and allocations for higher education in the state. Eight models were developed for consideration by the Task Force and representatives of the Reexamination of the Base Committee:

MODEL 1: Colorado's ratios would remain unchanged, but the definition of a graduate FTE student would be changed to 24 student credit hours to bring it more in line with the definition used in other states.

MODEL 2: The median ratios for the other 10 states in the sample (by discipline and level) would become the new guidelines for Colorado.

MODEL 3: This model is a two-step process. First, any ratio (by discipline and level) showing extreme variance (more than 3 students per FTE faculty) from the median for other states would be adjusted to the median value. The remaining disciplines would be adjusted upward by 10%

(undergraduate) or 15% (graduate). The ratios for vocational/technical disciplines would remain unchanged.

MODEL 4: At the undergraduate level, disciplines that show an extreme variance (more than 3 students per FTE faculty) from the median ratio would be adjusted to the median value. At the graduate level, the APCUP ratios would be multiplied by 1.25, which has the effect of changing the definition of an FTE student from 30 to 24 credit hours.

MODEL 5: Ratios (by discipline and level) showing a variance of greater than 10% from the median (plus or minus) would be adjusted to the median value. All other ratios would remain unchanged.

MODEL 6: This model applies to community colleges and senior institutions with fewer than 5,000 FTE students. When the Model 2 guidelines result in fewer than 2 FTE faculty in basic disciplines and areas of program specialization with at least 20 FTE students, an add-on amount would be calculated to bring the total number of FTE faculty in that discipline up to 2.0.

MODEL 7: This model would be the same as model 6 except that it would apply to institutions with fewer than 2,000 FTE students, and would apply to model 5 guidelines.

MODEL 8: This model would be the same as model 7 except that it would bring ratios showing a variance of greater than 10% from the median (plus or minus) to within 10% of the

median. All other ratios would remain unchanged.

Using political considerations of the cost involved for each of the models as well as data designed to measure the effects of each model by institution, sector, discipline, and level, Model 8 was ultimately selected as the model that would be recommended to the Reexamination of the Base Committee and, ultimately,incorporated into CCHE's allocation of state general fund appropriations..

Role Conflict for the Institutional Researcher

The institutional researcher was asked to develop the alternative ratio guidelines (called models) that would bring Colorado more in line with the ratios employed in other states, and the process became highly politicized. The community college and research university sectors campaigned heavily for alternative guidelines that would disproportionately benefit those sectors, and the researcher's own institution asked her to propose a model that would primarily benefit graduate-level instruction. The Institutional Researcher faced considerable role conflict as she attempted to maintain an impartial role while meeting the political needs of her employer. The researcher developed eight alternative models and employed spreadsheet tables to ascertain their effects on the number of FTE faculty at each institution (and hence, levels of additional funding that would be required). To alleviate her role conflict,

the researcher employed a process whereby she impartially presented the results of the analysis to the Task Force, and other unofficial university representatives made political arguments for the preferred alternative (Model 4).

This method of alleviating role conflict appeared to be effective, in part because the Institutional Researcher was able to present a mass of data compiled by her colleagues to show the need for a change in ratio guidelines and the effects on faculty funding of each of the models. However, upon hindsight, it probably would have been even more effective in maximizing the University of Colorado's investment in the decision-making process to assign another offical representative from the University of Colorado with decision-making authority.

Conclusion

"Lotus 1-2-3" proved to be a very effective software package for comparing Colorado's actual student/faculty ratios to the APCUP guidelines, as well as to the models employed in other states. It also proved effective in applying the eight alternative models to the original model to determine their effects on Faculty FTE and student/faculty ratios by institution, sector, discipline, and level. The major problem for the Institutional Researcher was the role conflict resulting from acting as staff person and institutional representative, which made it difficult for her to be maximally effective in either role. Institutional researchers must be cognizant at all times

of their role within the institution and take necessary steps to ensure that their effectiveness is not hampered by role conflicts that influence their effectiveness in their institutional or systemwide role.