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ABSTRACT

Drawing upon the responses of 268 instructors of randomly selected class sections offered at the Los Angeles Community College District during Fall 1980, this paper assesses the role of the faculty in remedying the underrepresentation of women, minorities, and the handicapped in science education. The paper first summarizes probable causes of this underrepresentation and then discusses the survey findings, focusing particularly on the characteristics of the 99 science instructors and their responses to questions related to: (1) their activities to recruit more students, particularly handicapped, women, and minority students, into their classes; (2) the importance of 14 activities and skills in terms of students' success in their courses; (3) the kinds of support services that were and should be promoted by their colleges; (4) the percentage of students needing seven specified support services, whether teachers' would recommend these services, and reasons why students do not take advantage of these services; (5) the emphasis given to nine student activities in their classes; and (6) reasons why women, minorities, and the handicapped are underrepresented in science programs. Finally, the paper presents summary conclusions, indicating that science instructors are aware of their students' limitations; are not greatly concerned with the student mix; and are continuing to use traditional modes of instruction. (JP)

INSTITUTIONAL FACTORS AFFECTING STUDENT PARTICIPATION IN COMMUNITY COLLEGE SCIENCE PROGRAMS

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The community colleges enroll the highest percentage of minorities among all postsecondary educational institutions. They also enroll sizeable percentages of returning women and handicapped students. Hence, it was natural that the National Science Foundation's concern with science education for women, minorities, and handicapped students would extent to patterns of science education for these groups in community colleges. During 1977 and 1978 the Center for the Study of Community Colleges had studied patterns of science curriculum and instruction in community colleges nationwide. In 1980, NSF funded the Center to study the performance of women, minorities, and handicapped students in the Los Angeles Community College District, the largest community college system in the nation. The data reported here stem from these studies of the students' course-taking patterns as revealed on their transcripts and of surveys of students and faculty members in the District.

Several reasons have been advanced to explain why women, minorities, and the handicapped are typically underrepresented in science curriculums and in science careers. For women, math aversion has been documented; for minorities, poor prior academic preparation has been advanced as a reason; and for handicapped, the lack of role models has been considered a detriment. For all the groups, insufficient career role information and cultural and social gaps are often considered to act as inhibitors.

On the other side, the incentives for enrolling greater numbers of women, minority, and handicapped students in science education courses have also been

traced. The community colleges have special tutorial and counseling services for women and minority students, and many campuses have special enablers for the handicapped. The ERIC files include numerous reports of special programs and services to aid members of these groups. But all students do not take advantage of these services. Many do not even know they are available. As an extreme example, in a study of students in fourteen California community colleges, Hunter and Sheldon (1980) found that one-fourth of the students who said that finances would be a problem for them while they were in college were unaware of the existence of a financial aids office. The tutorial, counseling, and other instructional support services have often suffered a similar fate.

What about the instructors? To what extent do they help members of these special student groups advance in science? To gain information that would help answer those questions we surveyed the instructors of 268 class sections in the Los Angeles Community College District. The sample was drawn by taking every thirteenth class section from a list of those offered on all nine campuses on Wednesday of the fifth week, Fall, 1980, at 10:00 a.m. and 7:00 p.m. Responses were obtained from 99 science instructors and 169 instructors of other-than-science courses.

The ratio of part-time faculty teaching science was 19 percent. The science faculty as a whole tended to be an older group: 60 percent of them had taught in a community college for more than ten years. These two dimensions marked the major distinctions between them and the nonscience instructors. Of the latter group, 26 percent were part-timers and only 44 percent had been teaching for more than ten years.

We asked the instructors to respond to the questions in terms of their class section that we had sampled. In response to a question as to why students were taking the course, nearly half the science instructors said it was required for

the student's major. How do students get into the classes? Some instructors indicated they had taken active steps to recruit students. Just over half had attempted to advertise their classes on campus, encouraged the counselors to advise students to take courses in the field, and/or tried to make their course relevant to the students' occupational interests. But the other side of that coin is that by their own admission nearly half the instructors had done nothing about student recruitment, tending instead to wait for the students to appear.

Table 1 Here

They assumed that the college's written documents, counselors, and the informal network of student interaction would propel the students toward their courses.

We asked about various activities important for student success in the class; how important the activities were and whether the students were able to perform them adequately. Around half the science instructors said that the students' abilities to do problems or assignments requiring statistics or higher order mathematics were not very important. Other "not very important" student abilities included working on laboratory exercises, writing papers or working on projects, and identifying biases that might influence the findings of a research report. On the other hand the characteristics considered quite important were the students' ability to summarize the readings, having the necessary time to complete course assignments, and work on problems requiring arithmetic. As for what the instructors felt their students were able to do, around one-third of the group said their students could not handle statistics or mathematics beyond arithmetic including college algebra, analytic geometry, or the calculus.

Apparently the instructors felt it important for their students to take the time to study, do arithmetic, and understand what they were reading. But significantly fewer instructors believed their students could do these tasks adequately than the number who felt that those abilities were important. In fact, there was

quite a disparity between what the instructors felt was important in the class and what they believed their students were able to do adequately. As an example, whereas 71 percent of the instructors said that it was important that their students spend a concentrated period of time--two hours or longer--studying for the class, only 35 percent said their students were able to do that. Similarly, twice as many felt it important that students have the necessary time to complete course assignments as those who thought their students did have the time. And twice as many felt it was important that their students be able to express themselves in writing as compared with the number of those who thought their students could do so. Furthermore, whereas 44 percent of the instructors thought it important that students learn on their own, pursuing ideas, and finding needed information, only 20 percent thought their students were able to do that adequately.

Table 2 Here

The science instructors' perceptions of their students' abilities ranked lower than did the nonscience instructors'. However, half the science teachers felt that their students at least could summarize the major points in the class reading assignments, work on laboratory exercises by following sets of written directions, work on problems requiring arithmetic, and understand the texts. And although the students' ability to express themselves when speaking was considered important by only one-fourth of the instructors, well over half of them thought their students were quite able to do so.

Is help available to the students? How many students need such support services as counseling, basic skills courses, and tutoring? We asked the instructors what percent of their students needed the services, and the responses spread almost evenly across the choices: 0-25%; 26-50%; 51-75%; and 76-100%. But the tendencies were for the instructors to think that more of their students needed career counseling whereas fewer of them needed tutoring in mathematics.

Furthermore, not more than two-thirds of the instructors would recommend any of the services: counseling, tutoring, or basic skills courses and laboratories. They felt their students did not take advantage of the services, were not willing to devote the extra time or effort. And they themselves felt these services were not very helpful.

Tables 3 and 4 Here

The science instructors tended to feel that their instructional materials were appropriate for the diverse background of the students taking their courses. However, more than one-fourth of them said their instructional materials were similar to those used in parallel courses at the state colleges and universities. This latter perception is not shared by Russell and Perez (1980) who examined a sample of texts used in the first-year general chemistry courses taught in California community colleges and universities and found the topics to be similar but the level of coverage to be quite at variance.

We asked questions of assignments and grading practices and found the overwhelming majority of instructors saying that all students study the same material at the same time. Only ten percent of the classes were reported as being self-paced. More than half the science faculty said that students' grades were determined relative to a fixed performance standard but one-fourth admitted to grading on a curve. Relatively few instructors based their students' grades on workbook completion, participation in class discussions, or on the students' preparing displays, models, or artwork. Most used quick score and essay exams, and 20 percent said that written assignments counted toward student grades. The instructors suggested that "acquaintance with concepts of the discipline," was given considerable emphasis in their classes whereas "relationship of the concept to the student's own values," received very few responses.

Table 5 Here

When asked why women, minorities, and the handicapped tended to be underrepresented in science, instructors responded that the students didn't know about careers in the sciences, they had inadequate background to take science courses, or they weren't interested in science. Few instructors seemed to place the blame on the faculty themselves for not taking deliverate steps to recruit students. Most felt that student recruitment and activities to help the students succeed in science were the responsibility of such ancillary services as special laboratories, tutors, and counselors. Around four of every five respondents said that these services were available.

Table 6 Here

Several conclusions may be drawn. First, the science instructors are realistic. They know their students. They are especially aware of their student's limitations. They tend to feel that most of their students could benefit from extra assistance but only around half of them would recommend the basic skills courses or the tutorial services available to assist the students in mathematics or science. They seem to take a dim view of any instruction offered by other than the regular classroom faculty.

Second, women, minorities, and handicapped students seem not to be among the instructors' most prominent concerns. Relatively few of them saw a need for restructuring what they were doing to accommodate these special student groups. Actually, recruiting any students to science seemed of little import to the instructors. By self report, only one in eight instructors had ever gone into a high school seeking students, talking about science classes with the high school teachers, or discussing the possibilities of science education for incoming students. And recall that 60 percent of the instructors had had more than ten years of experience in the community colleges. The classroom is the instructor's domain; students come to it on their own, are taught, and leave. Recruiting students

and recommending ancillary or support services for students who do not do well in the classes is done by a significant minority of the instructors, but most seem not to engage in those activities.

In summation, the community college offers access, one more chance for students who did poorly in high school. Some of the especially tailored, highly publicized programs to recruit and retain women, minorities, and handicapped students in science courses have had dramatic results with a few students. But in the main, most community college students find teachers in classrooms trying to get them to learn science and mathematics in traditional ways. Few students take advantage of the special services available to them. Most seem destined to get what instruction in and encouragement toward science they will get from their classroom teachers.

References

Hunter, Russell, and Sheldon, M. Stephen. Statewide Longitudinal Study: Report on Academic Year 1979-80. Part III--Fall Results. (ED 188 714). For earlier reports see also ED 184 636 and ED 180 530.

Russell, Arlene A., and Perez, Patricia L. "Stopping the Attrition of Science Transfer Students," in Brawer, F. (ed.), Teaching the Sciences, New Directions for Community Colleges, 31 (1980).

Table 1

If yes, what have you done to recruit more students to your courses? Please check all items that apply.

a.	Advertised my classes on campus	30
b.	Encouraged counselors to advise students to take more courses in my field	35
c.	Went into the local high schools to advertise courses in my discipline	12
d.	Changed the format or content of my course(s) to attract more women and minority students	12
e.	Tried to make my course relevant to students' occupational interests	34
f.	Developed and/or presented an extra-curricular offering in my subject area (forum, exhibit, lecture)	20
g.	Met with groups of students in college-sponsored organizations (e.g., women's resource center, Spanish club, EOPS) to discuss career opportunities in my field	14
h.	Developed special instructional strategies for teaching handicapped students	13
i.	Obtained information about career opportunities for *handicapped* students in fields related to my discipline	10
j.	Obtained information about career opportunities for *women* students in fields related to my discipline	21
k.	Obtained information about career opportunities for *minority* students in fields related to my discipline	13
l.	Other (please specify)	12

Table 2

How important are these activities in terms of students' success in this course? Please indicate how you would rate most students in this class in their ability to do each of the following.

		How important is this activity in this class?			Most of my students:		
		Important	Somewhat Important	Not Very Important	Are Able To Do This Adequately	Have Difficulty In Doing This	Are Unable To Perform This Adequately
a.	Summarize major points in class readings	63	29	9	54	40	6
b.	Spend a concentrated period of time—two hours or longer--studying for this course	71	23	7	35	59	6
c.	Have the necessary time to complete course assignments	81	15	4	48	48	5
d.	Work on laboratory exercises by following a set of written directions	42	14	44	49	42	9
e.	Work on a paper or a project in which students have to put together ideas from various parts of the course	23	26	51	32	53	15
f.	Identify biases that might have influenced the findings of a research report	18	25	57	16	58	26
g.	Express themselves when speaking	25	40	35	57	38	5
h.	Express themselves in writing	47	35	19	23	63	14
i.	Work on problems or assignments that require college algebra, analytic geometry, or calculus	35	21	44	18	49	34
j.	Work on problems or assignments that require arithmetic (e.g., multiplication, division)	56	20	24	50	41	9
k.	Work on problems or assignments that require statistics (proportions, probabilities)	17	23	60	9	59	33
l.	Learn on their own, pursuing ideas, and finding needed information	44	44	12	20	65	15
m.	Understand course reading assignments	80	18	2	47	52	1
n.	Understand the uses of science technical developments and uses in society	33	41	26	40	50	10

Table 3

Which of the following activities are promoted by this college? Which activities do you think the college should provide and/or increase? Please check all responses that apply.

	This college provides:	This college promotes this activity	This college should provide/increase this activity
a.	Information about special skills needed to succeed in my courses	68	48
b.	Special mathematics courses to help students succeed in my classes	79	51
c.	Tutors to help students who desire extra help in my course	80	32
d.	Special courses to help students improve their study skills (notetaking, test taking, writing)	65	51
e.	Lectures, demonstrations, or exhibits (not part of a course) on some aspect of this discipline	68	75
f.	Advertising courses in my area through flyers, posters, newspaper articles	60	76
g.	Resource persons (e.g., counselor, faculty member) who are willing to assist students with personal problems	83	38
h.	Opportunities for students to meet representatives from companies that employ people in my field	69	63
i.	Seminars, programs, or lectures on career opportunities related to my discipline	73	63
j.	Invitations to faculty members from four-year institutions to discuss their academic programs with students at this college	62	73
k.	High school students with information about programs, courses, or careers in my field	70	67
l.	An exam for students wishing to enroll in this course	66	91
m.	Counselors who are knowledgeable about offerings and career opportunities in my field	62	59
n.	Members of minority groups who are successful in my field are invited to campus to meet with students	49	89
o.	Women who are successful in my field are invited to campus to meet with students	57	84
p.	Handicapped persons who are successful in my field are invited to campus to meet with students	48	92

Thank you very much for completing this survey

Table 4

What percentage of your students could benefit from each of the special services listed below? Would you recommend it to your students? If students do not use a needed service, why do you think this is so?

	Percent of students needing service				Would you recommend this service?		Students do not take advantage of this service because			
	0-25%	26-50%	51-75%	76-100%	Yes	No	They are not aware of the service	They do not believe they can benefit from service	They are not willing to devote extra time or effort	They do not find services available at a convenient time
a. Academic counseling	24	21	35	20	66	25	13	25	26	11
b. Career counseling	11	25	28	36	70	27	22	19	20	11
c. Basic skills courses in reading and writing	15	32	32	22	61	35	9	12	44	11
d. Basic skills courses in math	26	27	23	23	54	41	9	12	39	10
e. Basic skills courses in the sciences	22	24	27	28	51	43	8	8	36	10
f. Tutoring in math	26	33	26	16	55	41	15	12	34	17
g. Tutoring in science	28	25	29	18	46	49	13	12	29	13

Table 5

Please indicate the emphasis given to each of the following student activities in this class.

	Not included in determining student's grades	Included but counts less than 25% toward grade	Counts 25% or more toward grade
a. Written paper assignments	42	37	20
b. Quick-score/objective tests/exams	15	16	69
c. Essay tests/exams	35	25	40
d. Workbook completion	77	16	7
e. Regular class attendance	46	42	12
f. Participation in class discussions	59	36	6
g. Research/laboratory reports	60	23	17
h. Displays, models, art work, etc.	96	1	2
i. Laboratory exams	74	13	13

Table 6

Nationwide, women, members of ethnic minorities, and the handicapped tend to be underrepresented in science courses, programs, and careers. Why do you think this is so? Please check all that apply.

	Women	Minorities	Handicapped	Most students at this college
a. Science careers are typically closed to these populations	16	17	27	10
b. Faculty advise these students against pursuing science courses and careers	12	11	14	8
c. Limited inclination to think along scientific lines	27	27	7	26
d. Inadequate background in the sciences	27	44	21	42
e. Lack of interest in the sciences	28	31	3	24
f. Lack of knowledge about careers in the sciences	33	39	27	36
g. Physical barriers	3	3	34	2
h. Poor background in mathematics	29	48	18	51
i. Limited preparation to comprehend course material	21	40	14	44
j. Poor skills in reading	13	38	9	43
k. Poor study habits	15	36	10	49
l. Difficulty in meeting course requirements	13	29	8	27