

EVALUATION REPORT



SNU-AID Project

PD AAm 552

PROGRESS REPORT

May 1, 1979~May 5, 1979

SNU-AID Program of Basic Sciences

Seoul National University

Seoul, Korea

Table of Contents

Introduction	1
General Statement	4
SNU Visiting Professor Exchange	5
U.S. Visiting Professor Exchange	16
Faculty Development	24
Library Acquisitions and Facilities ...	29
Equipment and Services	32
Research Support	36
Business Operations of the Program	40
Summary of Recommendations	41

SNU-AID Graduate Program of Basic Sciences

1979 Progress Report

May 1979

The SNU-AID Graduate Program of Basic Sciences for the period of September 1975 to September 1980 was established to improve the quality of graduate education in science at Seoul National University. Funding was provided by a United States Agency for International Development loan of five million dollars matched by a Korean Government grant of two million dollars in equivalent local won funds.

In 1974, a feasibility study team made the following recommendations to achieve the proposed goal:

1. Support should be adequate to enable SNU to become a center for advanced education and basic research on a par with the applied emphasis of KAIS and KIST.
2. Salaries for faculty should be substantially raised.
3. Research grants should be awarded on the basis of merit, not seniority.
4. Library facilities should be greatly expanded and modern library procedures and policies developed under professional guidance.
5. Teaching loads should be reduced generally and modified further for faculty active in research.
6. The promotion and tenure system should be reorganized with promotion and tenure granted on the basis of professional competence as established by objective peer evaluation.

7. Some modification of the Kwanak campus plan should be considered to incorporate actions proposed in the Report.

8. Graduate students should be granted financial support and special consideration in fulfilling military requirements.

9. An intensive recruiting program should be implemented with the means required to attract outstanding faculty personnel.

The loan program addresses most of these recommendations through the following activities:

1. Sending about two-thirds of the SNU Science faculty to the U.S. for study and research.

2. Bringing U.S. professors to SNU for teaching and research.

3. Increasing the size of the science faculty and providing scholarships for graduate students.

4. Funding for library acquisitions.

5. Funding equipment purchases.

6. Funding for research activities.

The budgetary allocations for each of these activities are shown by Fig. 1.

The Program plan called for a review of these activities in 1979 to evaluate the progress made. The review panel consisted of representatives of USAID, SNU and the three external examiners who have provided this report. The external members of the panel are:

Fig. 1
US-AID BUDGET

College of Natural Sciences
(Thousands of Dollars)

Category	Original	Revised (12/78)	Expended to 3/31/79	
			\$	%
US-VP	1,901	1,490	797	53
SNU-VP	1,300	1,300	668	51
Research Support	500	500	234	47
Library	400	400	163	41
Equipment	800	1,100	600	55
Uncommitted	99	210		
Total	5,000	5,000	2,462	49

Dr. Deborah Tepper Haimo, Professor of Mathematics, University of Missouri, St. Louis, Missouri.

Dr. Wendell Bragonier, Dean Emeritus. Graduate School, Colorado State University, Fort Collins, Colorado.

W. Ryland Hill, Dean Emeritus, College of Engineering, University of Washington, Seattle, Washington.

Dr. Haimo and Dr. Bragonier were members of the original 1974 feasibility study team.

General Statement

The program was planned to implement the recommendations of the feasibility study team. The proposed activities were expected to improve significantly the research capabilities of the College by both strengthening the professional backgrounds of the science faculty and increasing and improving the physical facilities. There was clear need for the development of research and scholarly activity in order to upgrade the graduate programs, particularly at the Ph.D. level.

It is hard to quantify the specific achievements of the program, but the review panel feels that there already has been a substantial change in the attitudes and aspirations of the faculty and that the momentum provided by the Program can lead to the realization of high quality graduate programs in science. The experience gained by the faculty in planning and running the present program has provided incentive to plan even further ahead and seek additional support. Already the Ministry of Education has recognized and responded positively to the need for funding for graduate students, support for the Research Institute, and a substantially increased budget for the University library.

SNU Visiting Professor Exchange

An important part of the AID project was that of sending the majority of SNU science faculty to the U.S. It was expected that, as a consequence, they would then contribute more effectively to strengthening graduate programs in science at SNU. For those with doctorates, the opportunities were to be provided for developing their research capabilities through interaction with scholars active in their fields at the forefronts of research activity; for being directly involved in research projects leading to publication; and for observing at first hand the structural and administrative functioning of Ph.D. granting institutions. For the few without advanced degrees, the primary benefit to be derived was in engaging in graduate study, possibly leading to the Ph.D. degree.

The initial plans for the project were largely followed. To date 68 faculty members have spent periods of varying lengths in the U.S. totaling 59.5 man-years. (See Fig. 2, SNU-VP to U.S.) Of these, 38 have returned and 30 are still abroad, including 6 working toward doctorates and currently supported by their host institutions (See Table I, SNU-VP Participants, and Fig. 3, SNU-VP Schedules).

The proposed expenditures for this program totaled \$1,300,000. Thus far \$668,000 has been expended, \$229,000 committed, and an additional \$187,000 is expected to be used in this category, leaving a balance of \$216,000 (See Fig. 4, SNU-VP Expenditures).

Correspondence with the graduate departments where the six SNU faculty members are involved in graduate study indicates that all are studying hard and benefiting from the experience. One, in oceanography, is making substantial progress in completing requirements and collecting data so that he may write a dissertation after his return to Korea. His thesis mentor is scheduled to be a visitor at SNU and thus will be close

Fig. 2
SNU-VP to the U.S.

	1976	1977		1978		1979		Total
	<u>Oct.</u>	<u>Feb.</u>	<u>Aug.</u>	<u>Feb.</u>	<u>Aug.</u>	<u>Feb.</u>	<u>Aug.</u>	
To the U.S.	5	10	16	10	14	13		68
Returned from U.S.		1	9	7	10	11		38
No. in U.S. as								
(a) V.P.	5	14	21	23	22	24		
(b) Degree candidate				1	6	6		

Table I
SNU-AID Graduate Program of Basic Sciences

I. S.N.U.V.P. Participants 1976 - 1979

	Name-discipline	School	Term
1st.	Wuhan Lee Mathematics	Univ. of Michigan	1976.10.21-77.4.20
	Jongsik Kim Mathematics	Rutgers University	1976.10.21-77.10.20
	Hwe Ik Zhang Physics	Louisiana State University	1976.10.21-77.10.20
	Pong Youl Pac Physics	Stanford Linear Accel.	1976.10.21-77.10.20
	Kwang Woong Lee Biology	Univ. of Calif. at Berkeley	1976.10.21-77.10.20
2nd.	Kim, Choon Min Biology	Vanderbilt University	1977.3.1 - 77.8.31
	Park, Inwon Chemistry	Univ. of Wisconsin Madison	1977.3.1 - 78.2.28
	Ha, Young Gu Chemistry	Iowa State University	1977.3.1 - 78.2.28
	Cheong, Chang Hi Geology	U.S. Geological Survey Natural History	1977.3.1 - 77.8.31
	Chung, Jong-Yul Oceanography	Old Dominion University	1977.3.1 -
	Lee, IlHae Mathematics	Michigan State University	1977.3.1 - 77.8.31
	Minn, Hokee Mathematics	University of Texas	1977.3.1 - 77.8.31
	Song, Hi Sung Physics	Penn. State Univ.	1977.3.1 - 78.2.28
	Chang, Joon Sung Physics	University of Michigan	1977.3.1 - 78.2.28

Table 1 Continued

	Hong, Soon Bok Physics	Stanford University	1977.3.1 - 77.8.31
3rd	Yoon, Jaihan Mathematics	Case Western Reserve Univ.	1977.9.1 - 78.8.31
	Kim, Sung Ki Mathematics	Univ. of Minnesota	1977.9.1 -
	Lee, Hyunkoo Mathematics	The Univ. of Connecticut	1977.9.1 -
	Chung, Jae Myung Mathematics	The Univ. of Connecticut	1977.9.1 -
	Kim, Jewan Physics	The Johns Hopkins Univ.	1977.7.1 - 78.6.31
	Lee, Min-Ho Physics	Univ. of Missouri	1977.9.1 -
	Yu, Kyung Loh Astronomy	Univ. of Arizona	1977.9.1 - 78.2.28
	Pak, Sung-Jae Physics	Colorado State University	1977.9.1 - 78.8.31
	Choi, Qui Won Chemistry	Purdue University	1977.9.1 - 78.8.31
	Lee, Youn Young Chemistry	Univ. of California	1977.9.1 - 78.8.31
	Pak, Hyungsuk Chemistry	Stanford Univ.	1977.9.1 - 78.8.31
	Lee, Tae Young Chemistry	Texas Technical University	1977.9.1 - 78.8.31
	Ha, Doo Bong Zoology	St. Louis University	1977.9.1 - 78.8.31
	Park, Sang Dai Zoology	School of Medicine Univ. of California	1977.9.1 - 78.8.31
Jeong, Bongil Geology	University of Washington	1977.9.1 - 78.2.28	
Kim, Wan Soo Oceanography	University of Washington	1977.7.1 - 78.12.31	

4th

Table I Continued

Kim, Jae Joo Statistics & Computer Sciences	Univ. of Wisconsin	1978.3.1 - 79. 2.28
Hyun, Jong June Astronomy	Univ. of Washington	1978.3.1 - 79. 2.28
Koh, Yoon Suk Physics	Univ. of Kansas	1978.3.1 - 79. 2.28
Kwon Sook-Il Physics	Univ. Southern Calif.	1978.3.1 - 79. 2.28
Lee, Koo-Chul Physics	Univ. of Southern Calif.	1978.1.1 - 79. 1.31
Kim, Hojing Chemistry	Univ. of North Carolina	1978.3.1 - 79. 2.28
Kang, Hyen Sam Microbiology	Univ. of California	1978.3.1 - 79. 2.28
Kang, Yung Sun Zoology	Univ. of California	1978.3.1 - 79. 8.31
Kim, Bong Kyun Geology	Stanford Univ.	1978.3.1 - 78. 8.31
Kim, Soo Jin Geology	Harvard Univ. Univ. of Chicago	1978.3.1 - 79. 2.28

5th Park, Hong Nai Statistics & Computer Sciences	North Carolina State Univ.	1978.9.1 - 79. 2.28
Lee, Sa Ge Mathematics	Univ. of Pennsylvania	1978.9.1 - 79. 8.31
Ko, Youngso Mathematics	Univ. of Michigan	1978.9.1 - 79. 8.31
Chang, Seihun Chemistry	Univ. Arkansas	1978.9.1 - 79. 8.31
Chang, Sae-Hee Chemistry	Columbia University	1978.9.1 - 79. 8.31
Woo, Jong-Chun Physics	Univ. of Southern Calif.	1978.8.1 - 79. 8.31
Lee, Woong-Jin Biology	Univ. of California	1978.9.1 - 79. 2.28
Lee, Chung Choo Zoology	Temple University	1978.10.1 - 79.8.31

Table I Continued

	Lee, In Kyu Biology	Univ. of California	1978. 9.1 - 79. 8.31
	Kang, Man-Sik Zoology	Univ. of Minnesota	1978. 9.1 - 79. 8. 31
	Jung, Chang Hi Meteorology	Univ. of Washington	1978. 9.1 - 79. 8. 31
	Park, Hee In Geology	Univ. of Michigan	1978. 9.1 - 79. 8.31
	Park, Yong Ahn Oceanography	Duke University	1978. 9.1 - 79. 8.31
	Chang Yul Chi	Univ. of Pennsylvania	1978. 9.1 - 79. 2.28
6th	Okkyung Yoon Mathematics	Univ. of Connecticut	1979. 3.1 - 80. 2.28
	Yung Taek Kim Statistics & Computer Sciences	Purdue University	1979. 3.1 - 80. 2.28
	Han Young Chung Statistics & Computer Sciences	San Diego State University	1979. 3.1 - 80. 2.28
	Byung Doo Choe Physics	Air Force Avionic Lab.	1979. 3.1 - 80. 2.28
	Su-Ho IE Physics	Brown University	1979. 3.1 - 80. 2.28
	Hee Myung Shin Physics	Univ. of Maryland	1979. 3.1 - 80. 2.28
	Hong sik Yun Astronomy	Kitt Peak National Observatory New Mexico State Univ.	1979. 3.1 - 80. 2.28
	Soon Woo Hong Microbiology	State Univ. of N.J.	1979. 3.1 - 80. 2.28
	Nam Kee Chang Biology	Univ. of Calif.	1979. 3.1 - 80. 2.28
	Hoon Soo Kim Zoology	Univ. of Southern Calif.	1979. 3.1 - 80. 2.28
	Joon-Ho Kim Botany	Univ. of Minnesota	1979. 3.1 - 80. 2.28
	Woo Young Lee Chemistry	Univ. of Calif.	1979. 3.1 - 80. 2.28

Table I Continued

Kun-Moo Lee
Chemistry

Texas Tech. Univ.

1979. 3.1 - 79. 8. 31.

Fig. 4

SNU-VP EXPENDITURES
(Thousands of Dollars)

<u>Years</u>	<u>Cumulative Expenditure</u>
1.25	27
2.25	293
2.75	471
3.25	640
3.50	668

Time period 4/1/79 - 9/30/80

Expended	668
Committed	229
Probable	187
Total	<u>1,084</u>

Balance 216

at hand for continued thesis direction. It is clear that in this case, the experience has been invaluable not only in providing direct advancement toward acquisition of the terminal degree for the Korean visitor, but in permitting him first hand exposure to those so committed to scientific research that, as he described, "They often continued to work all night." The effect was not lost on him. "I was tremendously and unforgettably impressed by their attitude toward research," he wrote. Another, working for a Ph.D. in physics education, has taken advantage of the offerings of two universities to work out a program providing for substantial breadth. A third, pursuing a doctorate in physics, has passed his Ph.D. qualifying examination with distinction and is making good progress toward the degree. The three candidates in mathematics are still completing their course work requirements.

This part of the program seems to be going well and serving the need that was envisioned of upgrading the competence of the faculty. It is important that a way be found for each of the six doctoral candidates to continue until the degree is attained before critical momentum is lost.

The senior science faculty members who came to the U.S. benefited from the experience in a way that cannot fail to have far-reaching consequences beyond those immediately apparent. The morale of those participating has been substantially raised. For the 20 percent or so who had never been out of Korea, it has been a valuable expansion of horizons with important professional benefits. In addition, there has been a marked increase in publishing as indicated in detail in Fig. 5.

The funds for this project have been well spent, and the projected benefits should be realized. The research climate has been enhanced, but in order to maintain the gains made, it is vital that continuing local support be sufficient to ensure reasonable teaching loads and adequate facilities, and that a merit system be instituted and supported that rewards productivity.

Fig. 5 - Publication Record for SNU-VPs

Field	1975-76 (Pre-AID)					1977-78 (Post-AID)				
	a	b	c	d	e	a	b	c	d	e
Math.	63	4	0	0	0	59	7	5	5	4
Phys.	27	6	0	0	0	21	16	21	3	2
Chem.	30	2	0	0	0	30	2	3	0	1
Biol.	47	0	0	0	0	44	11	15	6	6
Earth Sci.	28	6	0	0	0	28	6	4	0	1
Total	195	18	0	0	0	182	42	43	14	14

- a. Publications within Korea
- b. Publications outside Korea
- c. Seminars on research topics
- d. Lecture notes on advanced subjects published or in the process of publication
- e. Graduate courses on current research topics given by visitors

U.S. Visiting Professor Exchanges

The U.S. Visiting Professors project was to bring research scientists to SNU to collaborate with the faculty and provide expertise for the improvement of the graduate school. The plan was to have 64 visitors come for periods of 3, 6, or 12 months duration. Initially, \$1,901,000 was allocated for this (See Fig. 1).

Due to problems of time involved in arrangements for a distinguished professor to leave his home institution, the project was slow in starting, and the initial plans for the numbers of visitors, as well as for the expenditures appropriated, were revised downward. To date, 26 visitors have come and they have engaged in varied activities (See Fig. 6, US-VP to Korea; Table II, US-VP Participants; Fig. 7, US-VP Activities; Fig. 8, US-VP Schedules; and Fig. 9, US-VP Expenditures).

The effectiveness of the US-VP project has been variable. One serious problem that has prevailed in all the experimental sciences is the inadequacy of facilities for the visitors coupled with delays in arrival of equipment. In many instances, full advantage of the visitors' presence could not be taken because needed materials were lacking. In mathematics, where equipment is not a problem, the US-VP project has been particularly successful, visibly affecting the departmental atmosphere.

Student response to the visitors has been positive, students finding it easy to adapt to the American professors. The visiting professors generally were satisfied with teaching SNU students.

US-VP lectures were attended by faculty from many universities and their prepared lecture notes are being widely distributed. The full benefits of the project may thus be substantially broader than can be accurately assessed.

Fig. 6
US-VP to Korea

Term Appt.	1976	1977	1978	1979(to April)	Total
3 - 5 Months	2	1	5	0	8
6 - 10 Months		2	3	3	8
12 Months	1	5	4		10
Total	3	8	12	3	26

Table II.

SNU-AID Graduate Program of Basic Sciences

I. U.S.V.P. Participants 1976 - 1979

Name-discipline	School	Term
C.W. Kim Physics	Johns Hopkins University	1976/6/6 - 76/9/6
K.H. Lee Physics	Univ. of Missouri-Columbia	1976/9/1 - 77/1/8
D.H. Lee Mathematics	Case Western Reserve Univ.	1976/9/1 - 77/8/31
Paul R. O'Connor Chemistry	Univ. of Minnesota	1977/4/15 - 77/10/15
Sang-il Choi Physics	Univ. of North Carolina	1977/5/15 - 6 weeks.
Chong Jin Park Statistics & Computer Sciences	San Diego State University	1977/9/1 - 78/8/31
Chong Wha Pyun Chemistry	Univ. of Lowell	1977/7/1 - 78/6/30
Chung-Nim Lee Mathematics	Univ. of Michigan	1977/9/1 - 78/8/31
Martin S. Burkhead Astronomy	Indiana University	1977/9/1 - 78/8/31
Donald W. Hood Oceanography	Univ. of Alaska	1977/9/1 - 78/2/28
Moon-Jhong Rhee Physics	State of Maryland	1977/9/1 - 78/8/31
Eduard J. Stadelmann Botany	Univ. of Minnesota	1978/2/1 - 79/1/31
Dock Sang Rim Mathematics	Univ. of Pennsylvania	1978/1/1 - 78/8/31

Table II. Continued

Chang Won Song Zoology	Univ. of Minnesota Medical School	1978/5/15 - 78/8/15
Chung. W. Kim Physics	Johns Hopkins Univ.	1978/6/7 - 78/9/6
Kyoungsik Kang Physics	Brown University	1978/6/7 - 78/9/6
Gerald A. Rosenthal Botany	Univ. of Kentucky	1978/8/1 - 79/2/28
Robert C. King Zoology	Northwestern Univ.	1978/8/15 - 78/12/25
Hasong Pak Oceanography	School of Oceanography	1978/8/1 - 78/3/15
Kyong T. Hahn Mathematics	Pennsylvania State Univ.	1978/9/1 - 79/8/31
Youn W. Han Microbiology	Oregon State University	1978/9/1 - 79/8/31
Sungzong Kang Zoology	Mount Sinai University	1978/9/1 - 79/8/31
Seung-il Shin Microbiology	Albert Einstein College of Medicine	1979/2/20 - 78/8/20
Frank H. Kilmer Geology	Humboldt State University	1979/3/1 - 79/8/31
Kyung Whan Kwun Mathematics	Michigan State University	1979/3/1 - 79/8/31
Song, Pill Soon Chemistry	Texas Tech University	79/5/1 -
Duk-In Choi Physics	Univ. of Texas	1979/5/1 - 80/4/30
Francois Treves Mathematics	Rutgers University	1979/6/1 - 79/8/31
H.A. Laitinen Chemistry	Univ. of Florida	1979/9/1 - 80/2/28

Table II. Continued

Roland H. Good, Jr Physics	The Pennsylvania State Univ.	1979/9/1 - 79/11/30
M. Howard Lee Physics	University of Georgia	1980/3/15 - 80/6/15
Frank Raymond Mathematics	Univ. of Michigan	1979/5/15 - 79/8/14
Y.B. Kim Physics	Purdue University	1979/5/1 - 79/7/30

Fig. 7

US-VP Activities

A. Number of Courses Taught

Undergraduate	3
Graduate	14

B. Number of Theses Supervised

M.S.	12
Ph.D.	4

C. Seminars

Number	48
Average attendance	80

D. Printed Lecture Notes

Completed	7
Pending	7

Fig. 8

U S - V P SCHEDULES

	1976	1977	1978	1979	1980	
				E. S. Stemann		
			R. King	S. I. Shin		
BIOLOGY			G. Rosenthal	H. M. Moon	West	
			C. N. Song	S. Z. Kang		
			Y. W. Han			
		O. Connor		Laitinen		4.83
CHEMISTRY		C. W. Pyun		P. S. Song	P. S. Song	
		S. I. Choi				
			D. Hood			2.62
			H. S. Pak	Hollinghead		
				C. E. Grusch		
EARTH SCI.				F. Kilmer	J. C. Ingie	
					Moore	
			O. S. Kim			2.83
			C. J. Park		Raymond	
MATH		D. H. Lee		Reves	R. G. Ha.	
				H. T. Mann	H. C. Myung	
					W. J. Park	
	B. W. Kim		M. J. Rhee		C. W. Kim	R. Beebe
	K. H. Lee		Burkhead			D. I. Ghoo
PHYSICS			C. W. Kim	Y. E. Kim		Howard Lee
			K. S. Kang		R. H. Good	5.58
	0.91	3.54	7.62	9.13	2.16	23.36m/y

Completed — On duty — LA Signed Passed IC — Probable

Fig. 9

US-VP Expenditures
(Thousands of Dollars)

Year	USVP*	ALC	SUM
1.25	78	9	87
2.25	286	40	326
2.75	430	69	499
3.25	654	97	751
3.50	686	111	797

Time period 4/1/79 - 9/30/80

Expended 686

Committed 118

Probable 666

U.S.V.P. (505)

U.S.V.P.
with Sp. Pr. (93)

Coordinator (68)

A.L.C. 182

tal 1,652

Balance from revised budget (162)

* Incl. DRA

Because of problems in arranging long-term leaves and because some distinguished scientists will not leave their home institutions for long periods, it has been suggested that visitors might be more effectively used if they came for short periods of, say, two weeks, giving a series of seminars and lectures and conferring with faculty and students. Some of this has been done through the Research Support part of the Program.

Faculty Development

a. Faculty Size

The number of faculty members in each department increased and plans presented to the evaluation panel indicate that these numbers will continue to increase. Growth in enrollment, however, is offsetting any real gains in reduction of student-faculty ratios. With some faculty still in the States as visiting professors, the teaching load situation is particularly critical, but even when these faculty members return, the need to add staff to relieve the high student-faculty ratio will remain. Tables showing the enrollment, Fig. 10; the number of faculty members, Fig. 11; the faculty teaching loads, Fig. 12; and the number of students completing advanced degrees, Fig. 13, are offered in support of the above statements.

At the present time, graduate student assistants are used only to read papers or to help in the laboratories. Teaching assistantships should be instituted to enable graduate students to teach basic undergraduate courses under the supervision of a professor. The teaching experience will be useful to graduate students in preparing them for later positions as professors in Korea. In addition, the use of graduate assistants actually to teach classes can substantially alleviate the problem of heavy teaching loads of departments with extensive service course teaching.

Fig. 10
Student Enrollment

Year Degree Candidate	1975	1976	1977	1978	1979
B.S.	2,894	2,755	2,782	3,260	3,013
M.S.	81	153	177	192	298
Ph.D.	23	39	55	69	75
Total	2,998	2,947	3,014	3,521	3,386

Fig. 11
Number of Faculty

	1975	1976	1977	1978	1979
At Start of Year	80	81	83	88	91
Additions	1	2	8	3	2
Retired			2		1
Deceased			1		
At end of Year	81	83	88	91	92

Fig. 12 - SNU Faculty Data

SNU Faculty Salaries

Faculty Rank	1975	1977	1979	Ratio 79/75
Asst. Prof.	2,732	3,716	5,616	250 %
Assoc. Prof.	2,227	4,536	6,756	209 %
Prof.	3,632	5,136	7,857	216 %

Lectures by SNU Faculty

- 1975 -

No. of Classes	Lectures per week	Number of faculty	Lectures per Faculty
522	1,388	81	17

- 1978 -

No. of Classes	Lectures per week	Number of faculty	Lectures per faculty
652	1,706	91	18.7

Fig. 13 - Graduate Student Data
M.S. Degree Program

	1975	1977	1979
Admitted	37	78	210
Completed	42	54	38

Ph.D. Degree Program

	1975	1977	1979
Admitted	8	19	48
Completed	2	2	4

Scholarship Support

	1975	1977	1979
M.S.	73	85	133
Ph.D.	2	8	5

The reduction of teaching loads is essential to provide time for faculty to do the research that is basic to the graduate program and essential to the reputation of SNU as a leader in Korean science.

b. Faculty for Graduate Programs

The problem of attempting to conduct graduate programs with insufficient faculty is a serious one. A case in point is the situation in Computer Science where there is only one faculty member with a doctoral background in computer science and he is a joint appointee with the school of engineering. Two faculty members help with the teaching of the introductory computer science courses. This is not an adequate staff to provide graduate programs. Yet, since 1977, six students have completed MA's in computer science and two have completed course studies for the Ph.D. and are working on dissertations.

It is difficult to see how graduate programs can be maintained and degrees granted at the master's level when there is such an inadequate staff. That a Ph.D. program is in effect with students working on dissertations is even more difficult to understand. Bringing in outside lecturers is reasonable to fill some specific gap, but it is not a solution to an over-all program that needs the direction of a permanent staff with primary training in the discipline and with some substantial research experience. If advanced degrees are to be meaningful at all, they should be administered by those with adequate backgrounds for the task.

c. Faculty Salaries

Figure 12 shows that faculty salaries have increased dramatically since 1975; they are now more nearly comparable with salaries at KIST and KAIS, except that the major fringe benefit of housing is not provided by SNU.

A policy of rewarding those staff members who are productive in research as well as in teaching needs to be developed, publicized and implemented. Funds should be available for travel to international meetings to enable researchers to stay abreast of advances in their fields. Further, to highlight the importance of research and give it greater prestige, the establishment of an annual award for outstanding research productivity in the College of Natural Sciences might be considered. The award could carry a significant monetary prize and might be presented in a public ceremony with the recipient invited to talk about his work.

Library Acquisitions and Facilities

The results of the library procurement program under the SNU-AID Program are encouraging. In addition, the SNU library budget has been increased with further increases planned for the future.

The most recent count reveals that 213 scientific journals are currently being received and that about 3,500 books have been purchased. About 8,000 books are expected to be purchased by the end of the loan period. Funds remain in the budget for all divisions in the basic sciences (See Fig. 14, Library Accounting Summary). The amounts are sizable for some departments, especially Mathematics (\$81,000), Meteorology (\$17,000), Chemistry (\$16,900), Oceanography (\$12,700) and Physics (\$9,300). Purchase lists need to be reexamined to determine what changes should be made to utilize the remaining funds. Possibly some funds should be shifted to departments that could use the additional funds well.

Although only American publications can be purchased with AID loan funds, it was found possible to get microfilms of past issues of foreign journals from an American source. At present these are being purchased in the 35-mm format because the library has 35-mm readers, although of

Fig. 14 - Library Accounting Summary

SNU/AID Graduate Basic Sciences Program

Current Report April 15, 1979

THIS IS NOT AN ACCOUNTING RECORD-----But Is a Summary of Approximate Expenditures

<u>Department</u>	<u>Budget</u>	<u>Books</u>	<u>Journals</u>	<u>Total</u>	<u>Remainder</u>	<u>1979 Renewal</u>	<u>1980 est. Renewal</u>	<u>Uncommitted</u>
1. PHYSICS	\$ <u>29300</u>	\$ <u>4000</u>	\$ <u>16000</u>	\$ <u>20000</u>	\$ <u>9300</u>	\$ _____	\$ _____	\$ _____
2. BIOLOGY	\$ <u>40000</u>	\$ <u>1600</u>	\$ <u>34700</u>	\$ <u>36300</u>	\$ <u>3700</u>	\$ _____	\$ _____	\$ _____
3. CHEMISTRY	\$ <u>63000</u>	\$ <u>7500</u>	\$ <u>38600</u>	\$ <u>46100</u>	\$ <u>16900</u>	\$ _____	\$ _____	\$ _____
4. GEOLOGY	\$ <u>21500</u>	\$ <u>7400</u>	\$ <u>12360</u>	\$ <u>19760</u>	\$ <u>1740</u>	\$ _____	\$ _____	\$ _____
5. METERORLOGY	\$ <u>20700</u>	\$ <u>1040</u>	\$ <u>2560</u>	\$ <u>3600</u>	\$ <u>17100</u>	\$ _____	\$ _____	\$ _____
6. OCEANOGRAPHY	\$ <u>21700</u>	\$ <u>760</u>	\$ <u>7740</u>	\$ <u>8500</u>	\$ <u>12700</u>	\$ _____	\$ _____	\$ _____
7. ASTRONOMY	\$ <u>14700</u>	\$ <u>4900</u>	\$ <u>6280</u>	\$ <u>11180</u>	\$ <u>3520</u>	\$ _____	\$ _____	\$ _____
8. MATHEMATICS	\$ <u>190000</u>	\$ <u>20300</u>	\$ <u>88670</u>	\$ <u>108970</u>	\$ <u>81000</u>	\$ _____	\$ _____	\$ _____
				\$ <u>254410</u>	\$ <u>145660</u>			

NOTE: These numbers are "working" figures only. An exact accounting is given in the monthly and quarterly reports.

uncertain usefulness. The trend in the U.S. is toward the use of 16-mm which comes in more compact cassette form less liable to damage. The possibility of purchasing 16-mm reading equipment should be investigated. At present the 35-mm printing equipment is not functional. Printing of microfilm is essential so that needed articles can be copied for personal direct use.

In some fields, notably mathematics, the ability to browse through the actual journals is important to the development of ideas for research. This is more difficult with microfilm and should be considered when an alternative exists.

To be accessible, the science collection must be properly cataloged and shelved. It is important to have a professional science librarian who can assist professors and students in finding needed materials. Professional training of librarians is available in the U.S. and an effort should be made either to find or to train such a person for the science section of the University library.

Arrangements for inter-library loans with other universities and industrial laboratories should be developed to make the total collection of scientific materials in Korea available to all university and industrial research staffs.

Consideration might be given to having a faculty committee help to advise the library concerning acquisitions and library operation so as to make the collection of maximum use to students and faculty.

Equipment and Services

Without proper equipment, experimental research in the sciences is impossible. Equipment needs differ in the several science divisions and a total of \$800,000 was set aside for equipment purchases according to lists developed by each division. By late 1977 it was apparent that difficulties in bringing U.S. visiting professors to SNU would make it impossible to reach the budget goal for such visitors. Consequently, with AID and SNU approval, part of the US-VP budget was transferred to the equipment budget, bringing the new total to \$1,100,000.

a. Equipment Purchases

By early 1977, the Letter of Commitment for equipment purchases had been obtained and lists were refined for submission to several government agencies for review. Eventually the lists went to the Office of Supply for the Republic of Korea (OSROK) to be put out for bids. The process is time consuming and by April 30, 1979, with 16 months remaining, only 55 percent of the funds had been spent. It is expected, however, that all funds will have been expended by the end of the project. Figure 15 shows the present status of equipment procurement.

Several difficulties have arisen in the procurement process such as the following:

1. Equipment lists often showed a lack of departmental or divisional planning.
2. Because the lists had to be prepared near the beginning of the program it was not possible to include recommendations of the visiting professors from the U.S.
3. The lists consisted mainly of major items of equipment without the many small supporting items needed to conduct the desired research.

Fig. 15 - Equipment Purchase Status

Unit: \$1,000

Phase Division	First Phase	Second Phase	Third Phase	Fourth Phase	Fifth Phase	Total
Biology	179.6	36.7				216.3
Chemistry	110.7	55.0		41.2		206.9
Physics	18.7		86.7			105.4
Earth Sci.	91.0	112.5				203.5
Mathematics					14.1	14.1
				269.8		269.8
Total	400.00	204.2	86.7	311.0	14.1	1,016.0
Accu. Total	400.00	604.2	690.9	1,001.9	1,016.0	
Accomplished Percentage	36	55	63	91	92	

4. The OSROK procurement process is slow and cumbersome.

5. The lengthy procedures and paper work discourage bids on the smaller equipment items of small dollar value.

6. Installation of the equipment requires substantial building alterations; technicians for the installation have not been provided.

7. There has been little provision made for repairs and maintenance of the equipment. Perhaps the problem of installing and maintaining equipment could be solved temporarily, at least, by combining these activities with those of operating a small store to provide the badly needed supplies, glassware, chemicals, hardware and tools. Such an arrangement could supply the hands and the help needed for installation and maintenance, while the store could be kept open to sell to the research staff the small items of glassware, chemicals and other materials that are critical to the conduct of research. Probably two such technicians would be needed at the beginning, in order to handle both of the activities.

8. There is some duplication of large equipment items. Five absorption spectrometers are on the campus and an order for the sixth is being approved. One of these is in operation for less than an hour a week and the other four are not yet installed. An equipment review committee, as initially planned, should be asked to review all requests to eliminate unnecessary duplication. There also seems to be a tendency to order large equipment items without the necessary supplies and small equipment needed to make them effective.

9. The initial proposal made no provision for adding computer facilities in equipment requests. The present IBM 360 computer seems altogether inadequate for the demand. In addition to handling the administrative work of the University, the computer is used as the prime source of communication for the 20,000 students enrolled in a

correspondence program. As a consequence the growing number of students taking computer science courses do not have adequate access to the computer. There are no computer terminals at all in the College for faculty and student use.

Despite the above shortcomings, a review of the laboratories reveals that considerable equipment has already arrived (some from an IBRD loan), that building alterations are being made (particularly in Chemistry), and that installation is proceeding slowly.

b. Support Services

The report of the feasibility team in 1974 properly emphasized the need for machine and instrumentation shops and the necessary technicians to operate them. Chemistry, for example, has no glass blowing facilities and the machine shop in Physics was not capable of constructing delicate research equipment. Unfortunately, the situation has not changed very much as a consequence of the SNU-AID Program. Physics has received considerable large machine shop equipment but still has only one technician. Most of the technician effort still depends on the capabilities of the younger professors with recent Ph.D.s who learned about electronics and mechanics as graduate students. This is a very poor use of professors who have little enough time for research as it is.

Technicians are being produced in Korea but industrial demand for them has priced such persons out of the prevailing wage scale at SNU. Technicians who work on advanced research equipment need very special skills usually developed through years of work at a University. SNU should be hiring a considerable number of technicians to work with the knowledgeable professors to develop their ability to assist the research activity. If SNU is to be an outstanding graduate and research organization, it must make a large investment in support services for research.

Space is needed for graduate students to study and do research while they are on the campus. Rather than a large room for a group of students, there is need for individual study stalls or even individual offices and research spaces if they are to work effectively.

Research Support

To assist in building up the research activity essential to support a doctoral graduate program, the program budget included the sum of \$500,000 for research support activities. Figure 16 shows expenditures to April, 1979, and commitments for the remainder of the program. Although the Capital Assistance Paper for the Program mentions only "international collaboration in research" and suggests "short term visits to confirm research findings" and bringing "renowned American Scientists" for "symposia and conferences", the large budget allocation permitted development of a considerable scale of activities as follows:

a. Attendance at International Conferences by SNU Professors

As of April, 1979 18 SNU professors have attended international conferences in their research specialties, in most cases delivering papers of their own (See Fig. 17).

b. SNU Professors to the U.S. for Research Collaboration

As of April 1979, 10 SNU professors have gone to the U.S. for periods of one or two months to engage in research with their American collaborators (See Fig. 17).

c. U.S. Professors to SNU for Research Collaboration

As of April, 1979, 5 U.S. professors have come to SNU for periods of less than three months to collaborate with their Korean counterparts (See Fig. 17).

Fig. 16
Research Support Expenditures
(Thousands of Dollars)

Years	Cumulative Expenditure
1.25	None
2.25	16
2.75	34
3.25	193
3.50	234

Time Period 4/1/79 - 9/30/80

Expended	234
Committed	
Benson	140
Biology	60
Math.	36
Consultants	22
Res. Sub.	49
Total	541
Balance	(41)

Fig. 17 - Research Support Activities

SNU-VP Research Support Program

	1977	1978	1979(to April)	Total
Conferences	7	8	3	18
Collaboration	3	5	2	10
Total	10	13	5	28

US-VP Research Support Program

Term Appt.	1976	1977	1978	1979(to April)	Total
Less Than 3 months			5		5

d. Conferences at SNU

In August 1978, the SNU Department of Physics, with support from the Ministry of Science and Technology and the Korean Physical Society, was host to a conference on high-energy physics which attracted many distinguished participants who had been attending an international conference in Japan. The audience included physicists from other Korean universities and Asian countries.

In the summer of 1979 a mathematics workshop will bring eleven American Mathematicians to SNU for a three-week series of lectures and seminars to an audience of about 120 Korean and foreign mathematicians.

Both of these activities help to strengthen Korean educational capabilities in science and establish SNU as an Asian center in science.

e. Group Research Projects in Physics and Chemistry

By combining the Visiting Professor and the Research Support programs, arrangements were made to set up a research project in solid-state physics at the University of Southern California involving four SNU visiting professors and one U.S. visiting professor from USC. Research support funding provided for the purchase of about \$100,000 of research equipment to be first used at USC and later transferred to SNU where the research would continue after the end of the SNU-AID Program. This arrangement is helping to establish a research group at SNU rather than to use the SNU visiting professor program to support fractionated research efforts.

A similar program in kinetics is to start in 1979, also at the University of Southern California. A third research program in biology taking place at SNU involves 8 SNU professors and one visiting professor from the U.S.

Although the Research Support activity was not well defined at the start of the SNU-AID Program, the funds are being used imaginatively for the types of activities essential to the development of research at SNU. It also provides a model for future activities as Korean support funds become available.

Because a plan for the use of research support funds had not been developed before the start of the SNU-AID Program, very little was spent during the first two years. In the third year the rate increased substantially and all of the funds will have been spent by the end of the program.

The high visibility of the SNU-AID Program has perhaps been a factor in the recent decision of the Ministry of Education to provide the sum of \$800,000 for one year starting May, 1979, to support the Research Institute in the College of Natural Sciences. This and future support will help to maintain the momentum initiated by the SNU-AID Program.

Business Operations of the Program

Initially SNU had little experience in handling the business management of such a large scale operation as the SNU-AID Graduate Program of Basic Sciences. The initial step was to establish the Office of the Coordinator with the help of one secretary and an Assistant for the Coordinator. This was immediately followed by the appointment of the American Liaison Consultant in the U.S. to handle payments in the U.S. for a large share of the budget.

The choice of Mr. Paul Merrick as the American Liaison Consultant was a fortunate one. He and his wife have handled a huge load involving the U.S. and SNU visiting professors, the library procurement, the research support budget and many additional activities not originally contemplated in the plan. The cost of doing all this has been extremely

low as compared with other AID program of a similar nature.

During the tenure of the first Coordinator it was found that handling the Program business activities through the SNU business office was not satisfactory. Consequently, in the middle of 1978 a special business office for the Program was established adjacent to the Office of the Coordinator. That office has been especially helpful in handling the purchase of program equipment through OSROK. However, in the necessary relationships with the American Liaison Consultant the new office has proved to be a bureaucratic stumbling block. Such an office should serve the needs of the Program rather than to involve itself in monitoring decisions already made and approved by the Dean and the Program committees.

It can be expected that future support from the Korean Science and Engineering Foundation and from the Ministry of Education for research and graduate fellowships will provide for continuation of the many of the activities initiated by the SNU-AID Program. It is recommended, therefore, that the Office of the Coordinator be established permanently at SNU to handle such future international exchange activities of the University, including those outside of the College of Natural Sciences. The associated business office should likewise be continued but with its functions clearly defined and limited to serve the needs of the program.

Summary of Recommendations

The review team finds the Program to be generally well conceived and handled. Some improvements in the graduate programs in science are already evident but it is expected that most of the benefits will develop well after the end of the program.

Some problems foreseen in the Program plan and others that have appeared later give rise to the following recommendations in the report

which are recapitulated below:

1. With the increase in graduate enrollments, there is need for even more faculty additions after the Program ends.
2. Graduate programs, especially at the doctoral level, should not be initiated without sufficient resources both as to faculty and facilities.
3. Promotion and salary policy for the faculty should provide motivation for research and should not be based on seniority.
4. The momentum gained by the Program should be maintained through continued financial support for research, workshops, conferences, and faculty travel. In view of the establishment of KOSEF and the Ministry of Education funding for the Research Institute, the prospects for the future look encouraging.
5. Advantage should be taken of the expertise developed at SNU for handling international exchange activities by continuation of the Office of the Coordinator and the associated business office as a University center for such future activities.
6. Graduate teaching assistants should be used for teaching science service courses to help in reducing the teaching loads of professors engaged in research.
7. The great need for adequate research support facilities such as shops, technicians and stores should be met as soon as possible.
8. The library should employ a professional science librarian to organize and maintain the science collection to provide maximum access for students and faculty. Better microfilm readers and printing facilities are needed.

9. The present computer facilities and staff are inadequate to the needs of the College. Both should be improved.

10. Adequate office space is needed for graduate students and faculty.

11. Plans for equipment purchases should be reviewed centrally by a faculty committee to avoid needless duplication and to be sure that large items of equipment are backed up by the necessary small supplies and equipment to make them effective.

12. The present research environment is not conducive to the round-the-clock research activity essential to an outstanding graduate program. Not only is new equipment needed, but buildings must be heated (or cooled) and must be available to students and faculty at any hour every day of the week. The present isolation of the University also poses transportation problems that should be solved for students and faculty wishing to work at night and on weekends.

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