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Report No. 7252

PROJECT PERFORMANCE AUDIT REPORT

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION
(LOAN 1800-KO)

May 24, 1988

Operations Evaluation Department

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ACRONYMS

ADB	-	Asian Development Bank
EFB	-	Educational Facilities Bureau
EPB	-	Economic Planning Board
HTE	-	Higher Technical Education
JTC	-	Junior Technical College
KCUE	-	Korean Council for University Education
KEEB	-	Korean Engineering Education Board
KMEB	-	Korea Management Education Board
MOE	-	Ministry of Education
MOST	-	Ministry of Science and Technology
OECF	-	Overseas Economic Cooperation Fund
OSROK	-	Office of Supply, Republic of Korea
TERI	-	Technician Education Research Institute

Government of Korea Fiscal Year

January 1 - December 31

Academic Year

September - July

THE WORLD BANK
Washington, D.C. 20433
U.S.A.

Office of Director-General
Operations Evaluation

May 24, 1988

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: Project Performance Audit Report: Korea - Sector Program on Higher Technical Education (Loan 1800-KO)

Attached, for information, is a copy of a report entitled "Project Performance Audit Report: Korea - Sector Program on Higher Technical Education (Loan 1800-KO)" prepared by the Operations Evaluation Department.

Attachment

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PROJECT PERFORMANCE AUDIT REPORT

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION (LOAN 1800-KO)

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PROJECT PERFORMANCE AUDIT REPORT

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION (LOAN 1800-KO)

PREFACE

This is a performance audit of the Sector Program on Higher Technical Education in Korea, for which a loan of US$100 million was approved on February 19, 1980. After an extension of one year the loan account was closed on February 10, 1986, with an undisbursed balance of about US$150,000 being cancelled on that date.

The audit report consists of a Project Performance Audit Memorandum (PPAM) prepared by the Operations Evaluation Department (OED) and a Project Completion Report (PCR) dated June 27, 1986. The PCR was prepared by the implementing agency, the Education Facilities Bureau (EFB) in the Ministry of Education and, following some editorial modifications, was issued together with a commentary (added as Part II: Bank Observations) by the Region. Formulation of Part II followed a mission to Korea by staff of the responsible projects division (the former East Asia and Pacific Region Education Project Division).

The PPAM is based on a review of materials in Bank files, including the Staff Appraisal Report No. 2723a-KO of January 11, 1980, the Loan Agreement dated February 21, 1980 and records of the Board discussions of the project. This information was supplemented by data collected during a mission to Korea by an OED staff which included discussions with project implementation staff and field visits to project institutions. Bank staff associated with the project were likewise consulted.

The audit memorandum agrees with the main conclusions of the PCR. However, because of the novel character of the lending operation (Loan 1800-KO being the first sector loan in education), the PPAM is somewhat more detailed than would have been the case with a customary investment project; it tries in particular to discuss features peculiar to this new type of lending instrument.

As is customary in the preparation of audit reports, copies of the draft audit report were sent to the representatives of the Borrower for comment in February 1988. No comments were received.

PROJECT PERFORMANCE AUDIT REPORT

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION (LOAN 1800-KO)

BASIC DATA SHEET

KEY PROJECT DATA

Item	Appraisal Estimate	Actual
Total Project Cost (US$ million)	700.0	627.00
Underrun (%)	-	10.40
Loan Amount (US$ million)	100.0	100.00
Disbursed	-	99.86
Cancelled	-	0.14
Repaid)	-	26.90
Outstanding) as of 02/29/88	-	72.96
Date Physical Components Completed	12/31/83	06/85
Proportion completed by above date (%)	61	100
Proportion of time overrun (%)	-	41
Financial Performance	-	Good
Institutional Performance	-	Good

CUMULATIVE ESTIMATED AND ACTUAL DISBURSEMENT
(in US$ million)

FY	81	82	83	84	85	86
Appraisal Estimate	16.0	53.0	82.0	100.0	100.0	100.0
Actual	1.0	13.0	60.4	92.0	97.6/a	99.9/b
Actual as % of Estimate	6	25	74	92	98	100

/a: as of May 22, 1985.

/b: after final disbursement.

STAFF INPUT
(Staff weeks)

FY	77	78	79	80	81	82	83	84	85	86	Total
Pre-appraisal	8.9	23.2	17.7	-	-	-	-	-	-	-	41.9
Appraisal	-	-	88.8	32.9	-	-	-	-	-	-	121.2
Negotiation	-	-	-	15.5	-	-	-	-	-	-	15.5
Supervision	-	-	-	7.1	9.8	13.8	12.2	9.8	8.1	16.5	69.9
Total	8.9	23.2	106.8	55.6	9.8	13.8	12.2	9.8	8.1	16.5	248.5

OTHER PROJECT DATA

Item	Original Plan	Revision	Actual or Est. Actual
First Mention in Files			03/15/77
Negotiations	06-07/79		12/12/79
Board Approval			02/19/80
Loan Agreement Date			02/21/80
Effectiveness Date	05/21/80		04/07/80
Closing Date	06/30/84	06/30/85	02/10/86 /a
Borrower	Republic of Korea		
Executing Agency	Ministry of Education, Education Facilities Bureau		
Follow-on Project			
Name	Science and Technology Education		
Loan Number	2427-KO		
Amount	US$100.0 million		
Loan Agreement Date	06/15/84		

/a Date of final disbursement.

MISSION DATA

Mission	Sent by	Month/ Year	No. of Days	No. of Persons	Staff Weeks*	Date of Report
Identification	Bank	05/78	15.0	4	12.0	07/25/78
Preparation	Govt.	--	-			--
Preappraisal	Bank	10/78	30.0	4	24.0	01/11/80
Appraisal	Bank	03/79	28.0	3	17.0	01/11/80
Total			73.0	11	53.0	
Supervision 1	Bank	03/80	12.0	2	4.8	05/28/80
Supervision 2	Bank	09/80	02.0	1	0.4	10/17/80
Supervision 3	Bank	05/81	07.0	3	4.2	06/30/81
Supervision 4	Bank	11/81	04.0	2	1.6	12/15/81
Supervision 5	Bank	06/82	04.5	4	3.6	08/03/82
Supervision 6	Bank	11/82	06.0	2	2.4	12/06/82
Supervision 7	Bank	07/83	03.0	2	1.2	07/15/83
Supervision 8	Bank	03/84	01.0	1	0.2	03/20/84
Supervision 9	Bank	09/84	01.0	1	0.2	09/27/84
Supervision 10	Bank	05/85	01.0	3	0.6	05/28/85
Supervision 11	Bank	11/85	04.0	2	1.6	12/06/85
Completion	Bank	03/86	19.0	2	7.6	06/30/86
Total			64.5	25	28.4	

* Estimated number of staff-weeks attributable to this project (including travel time).

Currency Exchange Rates

Name of Currency (abbreviation): Won (W)

Exchange Rates:	US$1 = W
Appraisal Year Average (1980)	485
Implementation Period Average (1981-84)	770
Completion Year (1985)	1,120

ALLOCATION OF LOAN PROCEEDS
(In US Dollars)

	Category	Original allocation	Actual Expenditure
1.	Equipment	75,000,000	84,836,388.86
2.	Consultant's Services, Overseas Fellowships and Studies	15,000,000	15,019,065.95
3.	Unallocated	10,000,000	--
4.	Cancelled	_____	144,545.19
	TOTAL	100,000,000	100,000,000.00

PROJECT PERFORMANCE AUDIT REPORT

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION (LOAN 1800-KO)

EVALUATION SUMMARY

Introduction

This loan of US$100 million was the first sector operation in education. It was approved in February 1980 and became effective in April of that year. The original closing date (June 30, 1984) was extended by one year. The loan account was closed in February 1986 and a balance of about US$150,000 cancelled.

Total project cost was estimated at US$700 million, with the Government meeting US$370 million and the beneficiary private project institutions US$230 million. Because of a devaluation of the Won, actual project cost amounted to US$627 million equivalent, with a reduced Government's share of US$243 million and an increased contribution from the private sector of US$284 million.

Project objectives and Content

The sector loan aimed at improving Korea's higher technical education (HTE) system to enable it to cope with the increasingly sophisticated manpower demands of the country's industries. To this end, some 50 subprojects aiming at equipment upgrading in selected Junior Technical Colleges and university Colleges of Engineering and Schools of Management and ten national programs dealing mostly with staff development were envisaged. This improvement program was to be complemented by a number of supporting measures such as the establishment and operation of accreditation systems for HTE institutions.

Implementation Arrangements

The allocation of funds and the selection of beneficiary institutions were made according to guidelines and criteria agreed upon between the Borrower and the Bank. The applications for individual subprojects were prepared by the individual HTE institutions (with the assistance of Ministry of Education (MOE) staff as necessary). The applications were evaluated by a Deliberation Committee in MOE and, selectively, by an interministerial Planning and Management Committee. The Bank played a key role during the initial stages of project implementation, reviewing closely the application of the criteria and assessing the processes and thresholds used. Once this framework was in place, the Bank limited itself to an ex-ante review of sub-projects exceeding US$2.5 million equivalent, and to an ex-post verification of samples of relevant documents during supervision missions.

Implementation Experience

The project was carried out without any significant problems. Slight initial delays (PCR, paras. 3.29-3.31) led to an extension of the closing date by one year. Loan disbursement was virtually complete.

Results to Date

The Sector Loan has brought about significant improvements in equipping and staffing standards of the project institutions. However, part of the beneficial effect has been offset by a strong enrollment growth in the early years of implementation. This expansion was facilitated by a shift in higher education admission policies from an entrant to a graduate quota system with built-in benchmarks for attrition which exceeded previously recorded levels. The enrollment increases also negated efforts to achieve specific student/staff ratios covenanted in the Loan Agreement. The date for attaining those targets has now been moved from December 31, 1986 to December 31, 1990.

Sustainability

The sustainability of schools, particularly of technical schools, hinges on the allocation of adequate funds for operation and maintenance. The project institutions visited described their recurrent budgets as tight but sufficient.1/ However, this is not necessarily the case for non-project schools, particularly in the private sector. To assure the viability of private HTE institutions over the longer run will require an injection of additional funds, both for catching-up investments and for the maintenance and operation of schools.

Findings and Lessons

The most important finding is that the Korea Education Sector Program, the Bank's first sector operation in support of education, has demonstrated conclusively that the sector loan was superior to the conventional project approach in addressing basic policy issues to accelerate growth and development. To be sure, there were implementation problems and shortfalls which, in view of the program's novelty and the relative inexperience of the Borrower and the Bank in education sector programs, were to be expected, but the overall experience has been positive. Some of the lessons have already been incorporated into the design of Korea's Second Sector Loan, Loan 2427-KO, approved in May 1984. The following lessons are particularly significant in Korea's experience and may be relevant to other countries.

(a) A stable and responsible sector management agency (SMA), staffed by experienced personnel who remained long enough with the SMA to ensure continuity, was the key to the success of the Sector Program. As the Sector Program necessarily involved sub-implementing agencies, effective implementation

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1/ In addition, the existence of a Mobile Equipment Maintenance Center, an exemplary institution, assures a longer working life for educational equipment.

depended upon the SMA's skillful coordination of these agencies which themselves were well-staffed to handle the many tasks required by the sector loan. In the present case, the SMA was the MOE's Education Facilities Bureau (EFB), which included several specialized divisions staffed initially by 125 officials, and it was complemented by participating management agencies such as the Higher Education Bureau and the Economic Planning Board (PPAM, paras. 14-16; 23 and 63; PCR, paras. 3.01-3.02).

(b) The development and/or strengthening of institutional capability appeared to be quicker and more sustainable through the Sector Program because the Program required the SMA to focus on addressing specific issues in the education sector, to carry out overall planning for that sector, and to appraise and oversee sub-projects selected on the basis of approved criteria. The EFB, which had acquired extensive project implementation experience through four IDA/Bank education projects as well as other projects funded by bilateral and international agencies, reinforced its experience by institutionalizing the planning and evaluation procedures developed for the First Sector Program such that, before the completion of the First Sector Program, the EFB was well-prepared to serve as the SMA for the Second Sector Program in 1984 (PPAM, paras. 46-51; PCR, paras. 3.04-3.06).

(c) The use of a policy letter prepared by the Borrower was a more effective instrument for monitoring the addressal of policy issues than covenants because the former facilitated periodic review and adjustment as the program approached its objectives, whereas a covenant is inflexible. In this case, the covenant on meeting the target for a student-staff ratio, as part of the objective of improving educational quality, was found to be inappropriate because quality improvement (as indicated by a more favorable proportion of students to staff) was better monitored by a range of quality indicators than by a single indicator. This lesson has been applied in the Second Sector Program (PPAM, paras. 45 and 56; PCR, Part II, para. 22).

(d) The Sector Program required more time for preparation, but the additional time and resources invested in upstream, especially sector, work on policy analysis, testing of guidelines and criteria for selecting program beneficiary institutions, and sub-project appraisal were repaid in terms of more efficient implementation. Unit costs, based on Bank staff-weeks per US$ 1 million loan funds, were quite low (PPAM, para. 60; PCR, Part II, para. 25).

(e) Accreditation of higher education programs, as part of the process of quality improvement, required time and a regular budget to develop and maintain (PPAM, paras. 47-48; PCR, Part II, paras. 10-11).

PROJECT PERFORMANCE AUDIT MEMORANDUM

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION (LOAN 1800-KO)

I. PROJECT BACKGROUND

Project Formulation

1. The Korea Sector Program on Higher Technical Education was the first sector operation by the Bank in support of education and training. The loan (L1800-KO) of US$100 million assisted three specific subsectors in higher technical education (HTE).1/ Project identification and preparation had benefitted from a previous subsector survey (Korea: Education Subsector Memorandum on Higher Technical Training, June 26, 1978, Report No. 1927-KO), which had identified the main shortcomings and requirements of Korea's higher technical education system. Its tenor was that the ongoing changes in Korea's manufacturing industries towards greater technological complexity demanded engineers, managers and technicians who could cope with increasingly intricate tasks, and that these new demands required in turn a widening and deepening of the education and training for these occupations.

2. The themes of the subsector survey were elaborated upon by four Korean study teams which convened in August 1978 and presented a draft report for review by and discussions with, a Bank preappraisal mission in November 1978. Their final reports were incorporated into a loan request which formed the basis for the Bank's appraisal in April 1979 (Report No. 2723a-KO, Staff Appraisal Report: Korea - Sector Program on Higher Technical Education, January 11, 1980).

3. The findings of the study teams and of the appraisal mission can be summed up as follows: in terms of coverage and efficiency, Korea's HTE education system was thought to perform satisfactorily. However, there were indications of an incipient oversupply of engineering and JTC graduates (though not of management graduates); this development had occurred partly in response to previous shortages and resulting high salary differentials (reaching 8:1 for engineering graduates vis-à-vis primary school leavers in 1978).

1/ The term "higher technical education (HTE)" is used for the sake of brevity; it encompasses the areas of university-level engineering and management education and of higher technician training in Junior Technical Colleges (JTCs).

4. This expansion of HTE had, however, accentuated a number of basic weaknesses of the system. The first was lack of flexibility: the system of enrollment controls which was in effect at appraisal was deemed to respond too sluggishly to labor market developments, thus protracting specific shortages or oversupplies of graduates.

5. More important, however, were shortfalls in quality. These were apparent in several areas: first, the organization and content of teaching programs; HTE was characterized by early and rigidly maintained specialization, emphasis on theory and lagging graduate programs. Early, and definite, orientation of students towards a specific field was accompanied by a lack of program uniformity between schools. JTC studies were often a scaled-down version of the four-year engineering college programs, without regard to the different training needs of industrial technicians.

6. Practical elements, such as laboratory work in engineering or case studies in management courses, were not sufficiently emphasized: the former accounted for only about 10% of the entire undergraduate program, and the latter were virtually absent. Teaching was thus focussed on the theoretical elements and did not reflect the realities of industry.

7. This trend was reinforced by critical shortages in teaching staff and equipment which in turn had been accentuated by rapid enrollment increases in the recent past. Student/staff ratios in engineering (44:1) were almost twice as high as the average for higher education (24:1); in management courses, the difference was even greater. Moreover, these averages concealed wide variations, with the less prestigious and less wealthy schools having still higher student/staff ratios (in 1979 one half of management students were in classes of 130 or larger). To arrive at acceptable staffing levels (say, 21:1 in engineering and 40:1 in management) would have required a quintupling of the respective teaching staffs (to 2,500 and 1,000, respectively), between 1979 and 1982.

8. Not only was teaching staff lacking in numbers, but also in qualifications. Over half of JTC staff had been recruited directly from undergraduate programs and very few HTE teachers had any practical industrial experience.

9. Equipment was similarly insufficient. Laboratories were only stocked to about one-fifth of the standard MOE requirements of about US$3,000/student which were characterized by the SAR as "reasonable and modest."2/

10. The common explanation for all these deficiencies was lack of funds. Public pay scales were not sufficiently attractive to induce

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2/ SAR (Report No. 2723a-KO) p.12, para. 3.13 and Footnote 1.

engineers, technicians and managers to leave the private sector for a career in teaching,3/ and private institutions which had to depend mainly (to 85%) on--Government regulated--student fees to finance their operations, had to resort to understaffing and underequipping to finance the inherently expensive HTE programs. Underfinancing was seen as the main obstacle to the necessary development of HTE in support of ongoing and future industrial transformation. Investment needs in HTE institutions were estimated at US$830 million for the period 1979-83, with about 60%, or US$500 million, being required by private institutions.

Strategy for Developing HTE

11. It was clear that needs of this magnitude could not be addressed through a one-time investment effort, but only through a long-term improvement program supported by appropriate regulatory actions. The approach followed was both selective, in that it concentrated on a group of HTE institutions which offered the best prospects for quality growth, thus aiming at the development and strengthening of a core of good schools, and comprehensive, in that it dealt not only with the two most noticeable weaknesses--staffing and equipment--but supported the investments by a wide array of complementary actions.

12. The vehicle chosen for this improvement program was that of a sector loan. At the time of appraisal, this was still a rather new lending instrument, having not yet been used in the education sector. However, Korea was a very suitable test case: the Ministry of Education had an experienced and competent implementation group in place (the Educational Facilities Bureau (EFB)4/ which had been in charge of implementing the First, Second and about half of the Third Education Project),5/ there were large numbers of qualified personnel in the future project institutions, and the character of the project lent itself to decentralized preparation and implementation within a framework of centrally developed, uniform criteria and guidelines.

3/ In 1979 average salaries for university teachers ranged from about 50% to 75% of comparable salaries in industry, and from 40% to 50% in management (SAR, para. 3.10).

4/ See OED, Impact of World Bank Lending for Educational Development in Korea: A Review, Report No. 5950, December 5, 1985 (paras. 8.02-8.07) which judged the "growth and development of the Educational Facilities Bureau in the Ministry of Education....one of the most significant outcomes of Bank lending for education projects in Korea" (para. 8.01).

5/ The other half of the Third and the entire Fourth Education Project were under the responsibility of the Office of Labor Affairs in the Ministry of Health and Social Affairs.

Program Elements

13. The Sector Loan Program encompassed two different types of interventions: 55 (later 59) sub-projects benefitting individual institutions and ten national programs (dealing mostly with staff training and upgrading) addressing the requirements of the entire HTE sector. Of the total amount of US$100 million, 60% was to go towards engineering education, 36% to technician training, and 4% to management courses; 75% was to be devoted to equipment purchases, 15% to "non-facilities" investment (mainly training), and 10% remained unallocated (which was later almost exclusively used for further equipment procurement).

II. PROJECT IMPLEMENTATION

Implementation Responsibilities

14. Because of the size and complexity of the Sector Loan Program, an implementation structure with several layers was created. The Education Facilities Bureau which had acquired considerable experience in three previous Bank-supported projects (para. 12 above), served both as general coordinator/contact agency with the Bank and as intermediary for the physical investment elements of the program. For the software elements such as technical assistance and staff training, the Higher Education Bureau and the Industrial Education Bureau6/ assumed the functions of intermediaries for the university-level (engineering and management) and JTC subprojects, respectively.

15. The beneficiary private and national institutions were to prepare their subproject applications in accordance with guidelines and criteria (see para. 17 below) issued by the MOE after extensive consultation with the Bank. In the case of beneficiary institutions with limited experience in preparing investment/staff development programs, the three Bureaux mentioned in para. 14 were to act as resource and supervision units.

16. The individual subproject and national program proposals underwent a twofold screening, first by the Deliberation Committee in MOE for all subproject applications and second by an interministerial Planning and Management Committee under the overview of the Economic Planning Board whenever substantive issues were raised. Applications in excess of US$2.5 million equivalent were subject to previous Bank review whereas all others were reviewed ex-post during supervision missions.

6/ Transformed into the Nonformal and Vocational Education Bureau in 1981.

Guidelines and Criteria

17. To ensure a distribution of loan funds in line with the main program objectives and to avoid geographic or subsector biases, the selection of subprojects was governed by several sets of guidelines/criteria (see PCR, paras. 3.05-3.09 for details). These were related to:

(i) the broad allocation of loan funds with regard to field of study (engineering, management, technician training), program element (equipment, software), level (graduate/undergraduate), ownership (national/private) and geographic area (Seoul/rest of country), with lower and upper limits for individual subprojects;

(ii) the eligibility of institutions for participation in the program with a focus on viability (in terms of school, department and faculty size) and on commitment to better quality (to be expounded in a five-year development program); and

(iii) the detailed allocation of loan funds (approval of individual subprojects); here the emphasis was on relevance, feasibility and efficiency of applications which were to be assessed in the light of an institution's initiatives in program/curriculum development, its financial situation, availability of physical facilities, possibilities of inter-departmental use of equipment, etc.

Supporting Measures

18. This two-pronged (equipment upgrading/staff development) approach to HTE improvement was to be supported by activities in three related areas; the first was a strengthening of manpower planning capacities in the Economic Planning Bureau (EPB), in collaboration with the Ministries of Education and of Science and Technology. This would encompass further development of graduate tracer studies, specific technological manpower needs and refinements in customary manpower projections.

19. The second element was a reshaping of HTE curricula and study programs, with the aim of introducing greater flexibility while strengthening the practical components of HTE, developing new programs and encouraging multi-disciplinary activities, particularly at post-graduate levels.

20. The third, and potentially most momentous measure was the setting up of an accreditation system for HTE institutions. In 1979 there were over 1,000 engineering departments in more than 300 universities, graduate schools and JTCs. This degree of fragmentation called for the introduction of nationwide academic standards through an accreditation process. This work was to be undertaken by three entities created under the sector program, the Korea Engineering Education Board, the Korea Management Education Board and the Technician Education Evaluation Committee.

Implementation Experience

21. Despite the novelty of the lending approach and procedures, project implementation advanced smoothly with only one twelve-month extension of the closing date being necessary. The subproject evaluation procedures had been tested prior to Board presentation: two subprojects were processed during appraisal, and another six subprojects/national programs prior to negotiations. This pilot stage paid off in terms of improved evaluation methods and of early familiarity of the MOE review staff with the new lending instrument. Bank supervision missions found the appraisal work for the individual components and the related documentation to be of good quality. One ex-post review of seven bid invitations and related awards by the Bank found minor presentational problems in only two out of 543 items with a total value of US$22 million equivalent (Supervision Report of June 16, 1982); a previous review of eight sub-loan applications and bid evaluations/contracts comprising 30 equipment packages valued at US$2.5 million equivalent had come upon two insignificant evaluation errors (Supervision Report of December 15, 1981). Bank supervision missions had repeatedly high praise for the competence of the PIU.

Bank Supervision

22. Bank supervision focussed, correctly, on verification of procedures during the early stages of implementation and on monitoring of program benchmarks and system indicators later on. It can be summarized as both effective and efficient. In the few instances where appraisal expectations have not (yet) been fully realized, (paras. 39-45 and 47-48) the explanations have to be sought in the high ambitions of the program, the ascendancy of political and social considerations over technical (efficiency or educational) regards and the intrinsic slowness of major educational change, and not in any shortcomings in the work of PIU or Bank staff.

23. Borrower-Bank cooperation benefitted from a high degree of staff stability on both sides and close working relationships pre-dating the sector program. On the Bank side in particular staff continuity throughout the implementation period7/ no doubt facilitated the task of monitoring this novel type of lending.

24. One of the arguments advanced in favor of sector and other forms of non-project lending is its more economical use of Bank staff resources. The experience of this sector loan appears to support this claim: the Korea HTE Sector Program absorbed a total of 1.8 staff-weeks per US$1 million loan funds prior to Board presentation and 0.7 staff-weeks during implementation. A comparison with the figures in Table II-1 shows that in terms of unit costs (weeks of staff inputs per US dollar one million loaned) this operation does indeed fare well.

7/ Most of the supervision work was carried out by two staff; one of whom was associated with the sector loan from its preparation stage to about the halfway point in implementation, the other from the second year after effectiveness through completion.

Table II-1: STAFF INPUTS FOR SAMPLE OF EDUCATION PROJECTS AUDITED IN 1985-87

	Number of Projects	Staff Inputs (in Staff-Weeks) per US$ One Million Loan/Credit		
		Upstream	Downstream	Total
Large Projects (over US$20M)	10	4.8	3.4	7.7
Small Projects (under US$20M)	12	11.3	8.5	19.8
Average	22	6.7	4.8	11.5

a/ until Board presentation
b/ after Board presentation

Source: Relevant PCRs.

25. While the coefficients for the Korea Sector Program compare favorably with those in Table II-1, one should be careful not to attribute the difference solely or even largely, to the use of the new lending instrument since there are obviously economies of scale present as well. This becomes evident if one looks at the coefficients for the two largest projects in the first sub-group in isolation: the largest, in Mexico,8/ had upstream (downstream) staff inputs of 0.7 (0.9) weeks per US$ million and the second, in Indonesia,9/ of 2.6 (1.2) weeks, respectively. The experience of just one sector loan is clearly not sufficient to come to a firm conclusion as to the cost efficiency of this new lending instrument relative to customary investment projects. This point will be reexamined in Chapter IV of the PPAM.

Cost and Finance

26. The loan of US$100 million was to cover 14% of the total cost of US$700 million equivalent. The Government was to contribute US$370 million equivalent (53%) and private project institutions US$230 million equivalent (33%). Actual total costs amounted to US$627 million (the explanation for the lower figure being the devaluation of the Won),10/ with the loan share

8/ CONALEP I Project (Loan 2042-ME of US$90 million).

9/ Second Agricultural Training Project (Loan 1692-IND of US$42 million).

10/ Due to domestic price increases, total project costs in Won were more than 40% above appraisal estimates.

being 16%, the Government's 39% and that of the private sector 45%. Apart from direct financial assistance to private HTE institutions, the Government also arranged for commercial lending under an MOE guarantee (PCR, paras. 3.26-3.28).

III. PROJECT OUTCOMES

Quality of Education

27. Most available indicators suggest that the project has led to a substantial strengthening of the project institutions. Between 1980 and 1984, facilities and equipment and staffing (both in numbers and quality) have improved substantially.

Facilities

28. The number of laboratory and practice rooms grew by 10% in national and by 28% in private Colleges of Engineering; for national and private JTCs the figures were 77% and 9%, respectively. However, in terms of available area, national institutions could not hold their 1980 levels because of enrollment increases in the 1980-84 period.

TABLE III-1:
Korea - Availability of Laboratories and Practice Rooms in HTE, 1980 and 1984 by Level and Status (in percent of Requirements)

	By Numbers	By Area	By Numbers	By Area
	1980		1984	
JTCs				
National	65	92	115	81
Private	85	82	88	91
Both	81	84	93	89
CEs				
National	78	62	90	58
Private	94	57	120	78
Both	84	59	102	71

Source: Calculated from data in Appendices 22 and 23 of Project Completion Review Team, Project Completion Report on the First IBRD Education Sector Loan Project (1800-KO), Seoul, October 1985 (hereafter quoted as "PCRT-Report").

Equipment

29. At the same time, equipping standards improved greatly. Table III-2 gives the achievements of equipping targets for the project institutions in 1980 and 1984 by amount (value of equipment), quantity (number of equipment items) and kind (different types of equipment).

TABLE III-2:
Korea - Availability of Equipment in HTE, 1980 and 1984, by Level and Status (in percent of Requirements)

	1980			1984		
	Amount	Quantity	Kind	Amount	Quantity	Kind
JTCs						
National	18	31	35	98	74	74
Private	34	56	52	74	81	78
Both	29	50	46	82	80	77
CEs						
National	21	27	33	65	66	65
Private	31	41	45	68	77	75
Both	27	35	41	67	74	72

Source: Calculated from data in PCRT Report, Appendices 26 to 29.

30. The marked differences in attainment of equipping targets between the various subgroups (which are still more pronounced at the level of the individual project institution) reflect differences in enrollment growth and departmental composition rather than diverging equipping standards. All project institutions together increased their equipment availability to 71% of MOE standards, surpassing slightly the appraisal target of 70% (SAR, para. 4.22).

31. Not only did equipment increase in numbers, but also in quality. Table III-3 gives the unit value for required and available equipment in 1980 and 1984. Since equipment prices appeared to have remained largely stable during this period,11/ the observed increases reflect the introduction of more sophisticated equipment (and possibly also the establishment of new capital-intensive teaching programs) in the project institutions.

11/ The so-called G-5 MUV Index for Korea (price index for manufacturing imports from France, Germany, Japan, the United Kingdom and the United States) increased by only 1.7% during this period, and the general Manufacturing Unit Value (MUV) Index decreased by 5.1%.

TABLE III-8:
Average Value of Equipment Items
(in W 1,000/item) Required and Available, 1980 and 1984

	1980		1984		Change (%)	
	Required	Available	Required	Available	Required	Available
JTCs						
National	418	243	869	1,072	93.5	341.2
Private	323	199	479	432	48.3	117.1
Both	347	205	555	569	59.9	177.6
CEs						
National	1,019	793	1,326	1,295	27.1	63.3
Private	1,052	881	1,114	974	5.9	21.6
Both	1,038	798	1,178	1,064	13.5	33.3

Source: Calculated from data in PCRT-Report, Appendices 26-29.

32. Taken in conjunction, the figures in Tables III-2 and III-3 suggest that while both HTE segments (national and private institutions) have expanded and improved their equipment since 1980, the national institutions have done much better, both in the extent of improvements since 1980 and in the unit value of their equipment, than the private schools. The sector program appears to have resulted in a widening of the gap in capital intensity between the two groups: the installed equipment per student (on the basis of 1985 enrollments, to cancel out the effect of different enrollment growth rates, on balance somewhat higher in the private segment) was US$1,020 (235) equivalent in national (private) Colleges of Engineering. Since the achievement rates for equipping targets (Table III-2) show the private institutions ahead in almost every respect, the only possible explanation is that private institutions, because of their narrower financial base, are forced to concentrate on less expensive teaching programs with modest capital inputs.

33. Lest there be no misunderstanding, it should be stressed that without the Sector Program, the equipment standards of the private project schools would probably have deteriorated both relatively and absolutely. Nor should it be overlooked that there are a few private institutions that need not fear a comparison with the best national schools.12/ However, on

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12/ The fact that only five institutions (three of them private) accounted for more than two thirds of the 293 PhD degrees in engineering conferred in 1985/86 attests to the qualitative dominance of a few top schools. (Source: MOE, Statistical Yearbook of Education, 1986).

balance there can be little doubt that the financial base of most private institutions is too weak to permit the establishment and maintenance of increasingly costly high-tech programs. The heavy reliance of private schools on fee revenues, which are subject to Government regulation, limits their choice to three basic options: they can focus on less expensive teaching programs, use less costly inputs (including teaching staff) and/or increase class sizes.

34. Under these circumstances an increased level of Government support is crucial. During the sixth five-year plan (1987-91) Government contributions, commercial loans and donations totalling W 150 billion (about US$170 million equivalent at completion time) are contemplated (PCR, Part II: Bank Observations, para. 16). While this should help ease the financial situation of private institutions over the near future, in the longer run a gradual liberalization of fee policies, possibly combined with increased budget allocations for scholarships and provisions for student loans to counter the negative effect on educational equality, would appear to be an alternative worth while considering.

Faculty Development

35. Notable improvements took also place with regard to teaching staff: between 1980 and 1985, total teaching staff in Junior Technical Colleges increased by 17% to about 6,400 and in Colleges of Engineering, by 54% to 3,600. Because of simultaneous enrollment increases, however, the expected positive impact on the student/staff ratios failed to materialize: in Junior Technical Colleges the ratio moved from 43 to 46.5 and in Colleges of Engineering, from 45 to 55.13/

36. In the project institutions, however, student/staff ratios were much more favorable, standing at 24 for JTCs and at 36 for Colleges of Engineering, although the target ratios 18 and 21 given in the SAR and made the subject of a covenant (Section 3.09 of the Loan Agreement) were elusive goals even here.

37. Improvements in faculty qualifications were even more notable: in the beneficiary institutions the percentages of professors with minimum desirable qualifications (Master's degree in JTCs/PhD in Colleges of Engineering) rose from 40/54 in 1980 to 89/54 in 1985; the relevant 1985 percentages in relation to total teaching staff were 54% and 40%, respectively. While this fell somewhat short of the appraisal expectations of 70% and 43%, respectively (SAR, para. 4.18), the achievements are nevertheless impressive.

13/ Calculated from data in: Korea Council for University Education, The Condition of Higher Education 1986, Seoul, 1986.

38. The Sector Loan made key contributions to this upgrading process: the various national programs financed 472 study-years abroad for professors in Colleges of Engineering, 13[illegible] for professors in Management Colleges and 448 for professors in JTCs. In addition, more than 3,000 study-years in-country for JTC faculty were provided under the Sector Loan.

The Impact of Enrollment Growth

39. It became clear early on in the project that due to the unprecedented enrollment increases in HTE the 1986 targets for the student/teacher ratios[14]/ could not possibly be reached during the implementation period. The Government and the Bank therefore agreed to extend the adjustment period to December 31, 1990. It remains in doubt, however, whether the necessary reductions in student/teacher ratios can be achieved within this time frame: even if enrollments were to stay at the 1985 levels,[15]/ the additional numbers of teaching staff necessary to achieve the ratios of 18:1 in JTCs and 21:1 in Colleges of Engineering would be more than 7,000 and 5,900 respectively (compared to actual increases of about 900 and 1,250 during the period 1980-85). Short of large-scale (and not very likely) reductions in enrollments the above targets would appear out of reach in the short run.

Student Quota Systems

40. As is discussed in detail in Part II of the PCR (paras. 5-8), much of the surge in enrollments during the period 1980-85 was attributable to the switch in 1981 from an entrance to a graduate quota system. Coupled with fixed dropout rates of 30% for universities and 15% for Junior Technical Colleges (about twice the "natural" rates observed before), this meant an immediate boost in enrollments as institutions now were to admit 30% (15%) more students into the first year.

41. While the main objectives of this change appear to have been to enhance educational equality and to lessen the overriding preoccupation with the higher education entrance examination throughout the secondary school system, the introduction of more severe screening was also meant to inject a greater dose of competition into the higher education system. In recent years individual institutions have been given a greater measure of discretion in determining their intakes. As a result, the number of entrants into higher education appears to have stabilized at about 200,000 per year.

14/ 21:1 for engineering education, 40:1 for management education and 18:1 for technician education (undergraduate level); and 15:1 for engineering education and 20:1 for management education (graduate level).

15/ From 1985 to 1986 student numbers in Colleges of Engineering still increased, albeit by only 1.5%.

Relevant Covenants

42. It may be worthwhile to examine in somewhat greater detail the two loan covenants which were linked, directly or indirectly, to the size of the HTE system. The first (Section 3.07 of the Loan Agreement) obliged the Borrower to submit to the Bank and later on implement, "..... a flexible allocation system for higher technical education which will facilitate adjustment of supply of higher technical manpower in accordance with changes in labor market demand."

43. This wording suggests a concern with the large oversupplies of technicians and engineers projected at appraisal time for the period after 1982 (SAR, para. 4.08). If this was the case, the covenant was too general to be operationally meaningful. When the Government submitted its proposals for a graduate quota system, they were accepted as meeting the requirements of Section 3.07 (although the introduction of high fixed failure rates could hardly be expected to introduce greater flexibility into HTE enrollment practices.)

44. The second relevant provision (Section 3.09 of the Loan Agreement) suffered from a similar lack of specificity. It held the Borrower to taking "..... all necessary steps to introduce incentives for recruitment and retention of teaching staff ..... as may be required to achieve by December 31, 1986 [specified] student/teacher ratios" (see, para. 39, footnote 14). Since the wording did not state whether the target ratios were to include, e.g., teaching assistants or part-time teaching staff, target achievement was open to a large margin of interpretation.16/

45. Another, and more fundamental objection against this covenant is provided by the PCR itself (Part II, para. 22) and fully endorsed by the audit mission: the exclusive use of student/teacher ratios as a yardstick by which to measure educational quality. The qualifications of teaching staff, the level of research activities and the development of new curricula are but a few areas of educational quality in which the Sector Program has performed well, so that the dependence on just one indicator (and an undifferentiated one at that) is likely to conceal the extent of improvements brought about through this program. The Science and Technology Education Loan, a direct follow-up on this Program, has incorporated the lessons of the First Sector Loan by using a much broader range of quality indicators against which to check program performance (for details, see PCR, Part II, para. 22).

16/ In university departments of mechanical/chemical engineering, for example, part-time teaching staff accounted for one-third of all teaching staff in 1986, and the numbers of assistants reached 60%/90% of all full-time teaching staff (Source: Korean Council for University Education - Evaluation Report on Science and Engineering Education at Undergraduate and Graduate Levels in Korea; Summary. Seoul, September 1986).

Institutional Development

46. The Sector Program initiated and/or furthered a wide array of institutional changes. In the area of curriculum development, three basic curriculum models for engineering education (each with a different central objective and a different mix of subject matters) were developed (PCR, paras. 31-33). In technician education, the creation of the Technician Education Research Institute (TERI) attached to the Gyeonggi Open University has provided a focal point for all research, development, planning, staff training and evaluation activities. In the field of technician education curricula for more than 20 disciplines were developed, and educational materials for a total of over 70 fields.

47. The concept of academic accreditation has been firmly established: during the project implementation period, three accreditation committees were created to evaluate schools of engineering and management and Junior Technical Colleges. While the first round of evaluations was undertaken on a very tight time schedule (for instance, the 144 JTCs included in the accreditation process were examined by a team of 12 in a period of less than 150 days), future accreditation is seen as a continuous process, to be repeated in cycles of about five years. Responsibility for ongoing accreditation is now vested with the Korean Council for University Education and the Nonformal and Vocational Education Bureau (for JTCs)

48. The PCR (Part II, paras. 10-11) notes that the accreditation process is not yet the monitoring and control instrument envisaged by the appraisal mission but rather an information tool. However, the beginnings of a more active use of the system can already be seen: annual budgets for JTCs and research funds for university colleges are allocated in accordance with the results of the accreditation process.

49. In the field of manpower planning the capacity of the Economic Planning Board for manpower analysis and planning has been strengthened. A Manpower Development Committee has a coordinating and guiding role in all aspects of manpower planning including the determination of student quotas in higher education.

50. A significant achievement (supported by a modest equipment allocation of about US$0.1 million not foreseen in the original program) was the establishment and operation of a Mobile Equipment Maintenance Center attached to Gyeonggi Open University. The Center provides repair and maintenance services to technical high schools and JTCs in three alternative ways: advice on maintenance/repair which the school can undertake; repairs by roving teams of specialist; and repairs at the Center. During the years 1983-1986, the Center has received repair requests for a total of about 11,800 equipment items; nearly 6,800 items were repaired at the Center or by the mobile teams and more than 1,900 items by the schools themselves following technical advice by the Center. In about a quarter of the cases

the equipment was either too far damaged or too outdated to make a repair economical.17/

51. At the time of the audit mission, the Center had eight repair specialists (up from five at the time of completion). However, this was viewed as quite insufficient. To cover adequately six different equipment areas, six repair divisions with eight staff each were deemed necessary.

The Role of Women

52. The main objective of the Sector Loan was to enable Korea's HTE system to meet the future technical manpower requirements of the economy. It was thus not explicitly geared to the educational needs of women, the less so since HTE is generally perceived (not only in Korea but also in many other countries) as holding less attraction for women than other fields of study.

53. Unfortunately, the relevant project data are not differentiated by gender. However, there is indirect evidence that the Government and the project institutions have made a conscious effort to increase educational opportunities for women in the context of this program: the JTCs benefitting from the loan established 92 new departments with 9,280 places during the implementation period. More than half of these places were in fields which were known to hold relatively greater interest for female students than the traditional branches of engineering; examples are computers (2,000 places), pediatrics (720), electronics (600), commercial and industrial design (600), textiles (360), nutrition and food science (280).18/

54. Improved access for women to HTE is also evident from the relevant nationwide statistics: between 1979 and 1986 the numbers of female students in engineering increased more than six-fold to about 7,000 (although this was still an insignificant 3.4% of total engineering enrollments).19/ In JTCs the rise in female enrollments was more than five-fold (from under 18,000 to over 90,000), and the female share stood at 37% in the latter year, up from less than 25% in 1979. Statistics on female entrants (5.6% of all 1985 engineering school entrants in 1985 were women) suggest that the tendency towards increased female participation is likely to continue. Similar upward trends can be observed in the number of female graduate students and faculty.

17/ It was a very pleasing experience for the audit mission to see in one project school instruments that had been provided under the First Education Project of 1969 (i.e., more than 15 years ago) and which were still in good working order. Other equipment items from the same project were being repaired at the Center.

18/ Source: Calculated from data in PCRT-Report, Appendices 14 and 15.

19/ The figures in this paragraph are calculated from data in: Korean Council for University Education, the Condition of Higher Education, Seoul, 1986.

IV. FINDINGS

Project Content and Objectives

55. The central objective of the project was the qualitative improvement of HTE to enable the system to cope with the more complex manpower demands of Korea's industry. This objective was to be achieved by a two-pronged approach of equipment purchases and staff training/upgrading, complemented by several supporting measures such as accreditation of HTE institutions, curriculum development and a reshaping of the student quota system.

56. While the only numerical indicator for monitoring changes foreseen in the Loan Agreement (the student/teacher ratio) was too narrow to convey an adequate picture of quality improvements achieved under the program, there is not doubt that the equipment and staff development elements constituted quality improvements on a significant scale.

57. However, these improvements were to a large extent countermanded by unprecedented enrollment increases during the early years of implementation. The new graduate quota system, rather than serving as a mechanism for adjusting the size and composition of the HTE system to the requirements of the labor market (as had been hoped at appraisal) acted as a vehicle for this expansion.

Implementation Arrangements

58. The generally problem-free implementation of the Sector Program must be credited to the experience of the implementing agency (the EFB) and to the availability of qualified personnel in the participating project institutions to whom most of the project preparation work (e.g., preparation of equipment lists and related specifications, formulation of staff development programs) could be delegated.

59. The guidelines and criteria for the selection of beneficiary institutions and for the broad allocation of loan funds were extensively tested prior to negotiations and proved both appropriate and adequate. Ex-post reviews during supervision missions confirmed the correct application of these rules and of the relevant procurement procedures.

General Implications of Sector Loan Experience

60. While total staff inputs, particularly during the preparation/appraisal stage may have been rather large in absolute terms, the unit costs (staff-weeks per US dollar one million loan funds) were quite low. However, economies of scale would account for much of this economy of resource use. The experience of the Second Sector Loan (which started in 1984) should provide a better idea of staff requirements of this lending instrument in full development.

61. However, it must be emphasized that the savings in manpower are not absolute but relate only to Bank staff inputs. Due to initial unfamiliarity of Borrower staff with the new procedures and the large degree of decentralization of project preparation and implementation, it is likely that the total staff inputs (which could not be determined) may well have been higher than for a customary investment project of similar size and with a similarly experienced PIU.

62. A second comment concerns documentation: compared to traditional projects of similar scope, the files for this sector loan were not very voluminous. To some extent this would be the mark of a problem-free project implementation. However, in this case it probably goes beyond that and indicates a generic difference. Much of the information usually contained in project files remains with the Borrower and is only perused ad-hoc by supervision missions.

63. This points to the importance of staff stability for this type of lending activity. Thorough knowledge of a particular sector and country (which is a precondition for an effective supervision of such lending operations) is acquired only gradually and demands continuous efforts. To keep in contact with the educational realities of a given country, it is not sufficient to analyze statistical data (even in the few cases where they are both plentiful and reliable); factual knowledge derived from field visits and discussions with officials outside the central administration remain crucial inputs into an effective policy dialogue. In short, to make the new lending instruments work, part of the savings in staff inputs associated with its use will have to be invested in more and better sector analysis.

Sustainability

64. The outlook for continued improvements of Korea's HTE system appears good, once enrollments have stabilized. The Sector Loan has laid a solid institutional base for a course of continuous improvement, with the accreditation system as the potentially most powerful instrument for quality monitoring and guidance.

65. The adequate funding of private HTE institutions remains a challenge for Korea's educational policy makers. However, the Sector Loan and the related financial assistance measures provided by the Government are a large step in the right direction. Continued government commitment to the improvement of private institutions (para. 34 above) should permit the private HTE segment to maintain a satisfactory level of educational quality. In the longer run, a more flexible handling of fee policies, accompanied by appropriate modifications of scholarship practices, may become a complementary option.

Forward Linkages

66. The second sector operation was the Science and Technology Education Loan (Ln. 2427-KO of June 15, 1984). This loan pursues, for another segment of higher education, similar objectives as its predecessor. It is benefitting from the experience of the First Sector Loan in more than one way: both Borrower and Bank staff are more familiar with the new procedures, key institutions (such as the Korean Council for University Education) are in place and monitoring instruments have been refined (para. 45). These factors have so far assured a smooth implementation; completion is expected by 1990.

PROJECT COMPLETION REPORT

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION
(LOAN 1800-KO)

June 27, 1986

Projects Department
East Asia and Pacific Regional Office

PART I - COMPLETION REPORT PREPARED BY THE GOVERNMENT

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION (LOAN 1800-KO)

1. FOREWORD

1.01 The Sector Program on Higher Technical Education (Ln. 1800-KO) was implemented from February 1980 to June 30, 1985. It was the first education sector loan financed by the Bank. It was estimated to cost a total of W 340,000 million with loan financing of W 77,000 million equivalent to US$100 million. The objective was to upgrade the quality of higher education in Korea. The components included: upgrading the quality of teaching staff; development of curricula; purchase of laboratory and workshop equipment; and support to private and public institutions in the areas of engineering, technician education, and business administration.

1.02 The Borrower was expected to prepare and furnish to the Bank a project completion report, soon after completion of the Project, on implementation, expenses, revenue, compliance with covenants, and achievement of goals of the Project pursuant to Section 3.04, (3) of the Loan Agreement. The Ministry of Education, therefore, assigned a review team of five members for the above purpose in June 1985 and requested them to prepare an interim report by August 28, 1985, and the final report by October 28, 1985; these reports have been completed.

1.03 The Review Team studied documents and papers related to the sector program including the Loan Agreement, government documents on implementation of the Program, feasibility studies, and reports prepared by the Korea Engineering Education Board (KEEB), Korea Management Education Board (KMEB), and Technician Education Research Institute (TERI). Information was also collected through questionnaires sent to project schools. The review team selectively visited Project institutions, and surveyed the status of teaching staff, development of curricula, availability of laboratory and workshop equipment, its operation and maintenance, and evaluated the achievement of project goals. Persons related to the project were interviewed.

1.04 The Review Team was organized as follows:

Title and name	Institution	Remarks
Prof. Lee Mu-keun	Seoul National Univ.	Leader of the Team,
Prof. Back, Hyung-hyun	Korea Univ.	Member
Prof. Kwak, Soo-il	Seoul National Univ.	Member
Prof. Lee, Woo-il	Kyungbuk National Univ.	Member
Prof. Hyung, Sung-woo	Chunbuk National Univ.	Member

2. PROJECT BACKGROUND

Socioeconomic Background

2.01 The Government's Strategy for Economic Development. The basic goal of the first five-year Economic Development Plan (1962-1966) was to increase national income. The Government pursued economic development in priority areas such as raising agricultural income, correcting imbalances in the national economy, securing power sources (electric and coal power), expanding key industries, increasing employment, developing land, increasing export volume, improving the position of international payments, and developing science and technology.

2.02 The main goals of the second five-year Economic Development Plan (1967-1971) were to modernize the industrial structure and further facilitate economic growth. The Government promoted economic development in such areas as supply of food, increase of exports, import substitution, improvement in the balance of payments, increase of employment, birth control, and increase in national products and agricultural income.

2.03 The third five-year Economic Development Plan (1972-1976) was aimed at developing heavy and chemical industries to achieve industrial modernization, and creating a new agricultural society under the Saemaul Movement based on progress achieved under the 1st and the 2nd Plans. The priority areas promoted were heavy and chemical industries, self-sufficiency in food, increase in the income of farmers and fishery workers, improvement in the standard of living, increase of exports, improvement in the structure of exports, and advancement in science and technology.

2.04 The fourth five-year Economic Development Plan (1977-1981) had as its aim to establish a self-developing structure under the ideal of security of the Republic, growth, equity, and efficiency.

2.05 The fifth five-year Economic Development Plan (1982-1986) aims at economic stability through efficiency and balance, continuing economic development, balanced growth among the different income levels, and promotion of national welfare.

Industrial Advancement and Manpower Requirements

2.06 Korea's early economic development was based on agriculture. During the first through the third Economic Development Plans, increased export volume was promoted mainly in labor-intensive industries. Since the fourth Plan, this was changed to technology-intensive industries to develop products which provided much added value.

2.07 Training of high technology engineers needed for an advanced industrial society requires various measures, such as developing curriculum at the college level, upgrading the quality of teaching staff in colleges, laboratory and workshop equipment, and recruiting qualified high school students to college science and technology programs.

2.08 A long period of adaptation was required for higher technical manpower to acquire full production capability. The adaptation period for technologists in Korea was two to three years compared with six months for those in advanced countries.[1/] To shorten this period, measures were adopted to increase laboratory and workshop equipment in colleges.

Problems in Higher Technical Education in Korea

2.09 Several problems were identified at the time of appraisal:

(a) Student Quotas. A rapid growth in enrollment in colleges/universities began in the early 1960s. The number of students increased about 2.5 times from 1975 to 1982.[2/] Enrollment in colleges of engineering increased rapidly from 1978. This phenomenon was caused by the increased demand for higher technical manpower along with the growth of the economy and the industry in Korea. It was also the result of the Government's policy for college education. The rapid growth in the number of college students, however, was not accompanied by an increased quantity of teaching staff and facilities, resulting in an unsatisfactory level of achievement in education;

(b) Teaching Staff. There was an acute shortage of qualified teaching staff in higher technical programs. In junior technical colleges, more than half the teaching staff were high school teachers or were assigned to their current jobs directly after graduation from university and had no experience in industry. They did not have the capability to develop and teach related curricula and there were no systematic programs to improve their quality.[3/]

(c) Shortage of Laboratory and Workshop Equipment. Laboratory and workshop equipment is a prerequisite for technical education. However, in 1977, the availability of equipment at colleges of engineering in proportion to the Ministry of Education's (MOE) standard requirements was 33%. For junior technical colleges, the ratios were 25% for national colleges and 19% for private colleges. At these ratios, no normal laboratory and practical training could be conducted.

1/ IBRD Staff Appraisal Report, Korea Sector Program on Higher Technical Education, No. 2723a-KO, 1980.

2/ Kim, Chun-Wook et al., 1983, Study on Feasibility of Expansion of Equipment in Colleges of Engineering, p.1.

3/ Kim, Yoon-Tai et al., 1979, Study on Education in Junior Technical Colleges, p. 24.

Project Formulation

2.10 The MOE had already imported and distributed laboratory and workshop equipment totaling US$69.2 million to 131 schools of various levels under the first through third Education Loans from IBRD before implementation of the sector loan. The Ministry has made a concentrated investment in training skilled workers for economic development in Korea through assisting 64 agricultural, technical, and fisheries high schools. The first three projects have trained skilled manpower for local industries, and the impact of these projects has spread beyond the institutes financed through demonstration effects on other schools. In addition, the Bank also financed a US$23 million loan to vocational training institutes under the Ministry of Labor. The Ministry of Education has also received loans from the US Eximbank and the Japanese OECF for development of facilities in colleges of natural sciences and medicine.

2.11 In preparation of the first IBRD sector loan, the Ministry appointed three research groups to carry out feasibility studies on these areas: engineering, technician, and business administration education. The groups conducted their research activities for one year until March 31, 1979. They found problems in the education system, teaching staff, laboratory and workshop equipment, and education-industry cooperation, and proposed future improvements. At their recommendation, the Ministry proposed the Higher Technical Education Sector Program to IBRD. The project was appraised in two stages in October 1978 and March 1979, and the Loan Agreement was signed in February 1980.

Objectives of the Sector Program

2.12 Upgrading the Quality of Teaching Staff. The appraisal targets for upgrading staff qualifications are shown in Table 2.1.

Table 2.1: STATUS OF DEGREES HELD BY TEACHING STAFF

Classification	As of 1977 (%)	Goals in 1986 (%)
Engineering (Doctor's)	38	43
Management (Doctor's)	28	50
Technician (Master's)	43	70

Source: IBRD; 1980 Staff Appraisal Report on Korea Sector Program on Higher Technical Education p.59.

In addition to degree fellowships, teaching staff were to be upgraded through short-term overseas training and local seminars. The sector program included overseas non-degree training for 1,370 professors.

2.13 Development of Curricula. A major objective of the program was to strengthen the analytical and practical skills of higher technical manpower through teaching programs. The curricula was revised in 1980. Curricula for engineering courses were to be improved by:

(a) Increasing credit requirements for basic science and engineering subjects from 24% to 40% of available time;

(b) Increasing credit requirements for experimental and practical work from an average of 10 to 25.

(c) Adding new engineering programs, particularly in industrial engineering, operations research and instrumentation;

(d) Developing multi-disciplinary programs.

2.14 Purchase of Laboratory and Workshop Equipment. The goal was to increase the availability of equipment to 70% of MOE requirements. The invested value in equipment per student was to be increased from US$500 to US$2,000. The goal of 100% availability of equipment required by MOE was postponed to the late 1980s. The priority in equipment acquisition was as follows: equipment for

(a) electronics, and mechanical, electrical, and chemical engineering;

(b) basic science laboratories; and

(c) teacher training at the graduate level.

When the equipment was acquired as planned, the class hours for laboratory and practical work were expected to increase from 10% to 30% in colleges of engineering, and from 20% to 40% at junior technical colleges.

2.15 Supporting Private Institutions. The sources of financing for private institutions in the school year 1979 were school foundation funds, 7.2%, student tuition, 84.6%, and miscellaneous, 8.2%. The financial conditions of private institutions were very poor.[4/] The Korea Education Development Institute proposed a gradual model for developing private institutions as shown in Table 2.2.

4/ Yoon, Jung-Il et al., 1983, Modern Administration of Education, p.455.

Table 2.2: A GRADUAL DEVELOPMENT MODEL FOR PRIVATE INSTITUTIONS

Grades	Years	Basic direction for development of private institutions
The 1st step	Until 1983	. Long-term, low rate loans. Tax concessions. New Law for developing private institutions
The 2nd step	1984-1988	. Raising funds. Establishing funds for private institutions
The 3rd step	1989-	. Various loans and support.

Source: Prospect and Task for Educational Development, p. 149.

2.16 According to the sector program Staff Appraisal Report, the investment amount per student in the private colleges of engineering was on the average US$400, which was only 70% of that in the national (public) colleges of engineering. Also, in national colleges/universities there were 27 students per professor and private colleges, 35 students per professor. Private colleges were short of teaching staff due to their poor financial conditions and inability to recruit more teaching staff.5/

Program Content

2.17 The sector program consisted of 10 national programs and about 55 subprojects to be carried out by eligible institutions, in the following areas:

(a) Adjusting manpower supply and demand by:

(i) establishing a permanent capacity for manpower analysis and continuous monitoring;

(ii) implementing a flexible student allocation system which permits transfer of students between departments and across fields while maintaining entry standards; and

(iii) introducing in-service and retraining programs.

5/ Lee, Kwan et al., 1980, A study on ways to assist private colleges of engineering, p.23.

(b) Improving quality by:

(i) establishing accreditation agencies to set and enforce appropriate training standards;

(ii) adapting new content to existing teaching programs to direct industrial requirements, and introducing new programs to strengthen analytical and practical skills;

(iii) increasing the supply, and improving the qualifications, of teaching staff; and

(iv) providing laboratory equipment for teaching purposes.

(c) reducing the investment gap between private and public higher technical education by:

(i) channelling funds to private institutions;

(ii) assisting private institutions to obtain required resources; and

(iii) studying the feasibility of increasing private institution revenue through increased student fees.

3. PROJECT IMPLEMENTATION

Organization and Staffing

3.01 The organization for carrying out education loan projects relies on existing line agencies in MOE. The Education Facilities Bureau (EFB) of MOE was established in 1969 for implementation of the 1st IDA Credit, No. 151-KO and has carried out in succession the 2nd and 3rd IDA/IBRD Loan Projects, the US Eximbank Loan Project, the Japanese Overseas Economic Cooperation Fund Loan Projects, and the Asian Development Bank Loan Projects. The Bureau has had extensive previous experience in executing education loan projects, and is responsible for planning and supervising the physical aspects of project implementation and for general coordination of loan programs and liaison with the World Bank. The Higher Education Bureau in MOE managed the software components of university engineering and management education, and the Industrial Education Bureau that of technician training. The above two bureaus oversaw the establishment of the accreditation systems for engineering education, technical education, and management education.

3.02 In 1981, the Industrial Education Bureau was reorganized into the Nonformal & Vocational Education Bureau. The Junior College Academic Affairs Division under the Bureau was responsible for implementing the software components, hereafter referred to as nonfacilities programs for junior technical colleges. Two committees, the Deliberation Committee in MOE and the Planning and Management Committee in the Economic Planning Board (EPB) were responsible for evaluating loan-financed subprojects.

3.03 At the time of signing of the sector program Loan Agreement in 1980, the EFB consisted of: Planning Divisions I and II, the Equipment Division, Maintenance Division, Foreign Capital Projects Office and School Building Construction Office, staffed with 125 officials. These divisions were reduced in 1983 to the Facilities Planning Divisions, Equipment Procurement Division, Equipment Maintenance Management Division, School Building Construction Division, and Foreign Capital Project Division, with some 57 staff.

Detailed Procedures of the Sector Program

3.04 The 5th education loan was provided in the form of a sector program which is a different type of loan from those of the first three IDA/IBRD projects. The main point of a sector loan is the focus on addressing issues in a specific sector and overall planning of that sector. The borrower organizes a management agency, which decides and oversees subprojects, and takes charge of them. Loan allocations for subprojects over US$2,500,000 were to be approved by the Bank in advance. Therefore, two overseas training programs for professors of engineering and management education under the non-facility category and five subprojects under the equipment category for Seoul National, National University Hanyang, and Busan Junior Technical college were approved by the Bank in advance and implemented. Procedures for processing subprojects are shown in Table 3.1.

Table 3.1: PLANNING AND APPROVAL OF SUBPROJECTS

Steps	Processing of subprojects
1. Planning of subprojects	General guidelines prepared and distributed by MOE - Participation decided by project schools - Planning of subprojects by project schools
2. Evaluation of subprojects	Review of proposed subprojects by MOE - Organization of a review team by MOE - Field survey by MOE and survey team - Review of subproject programs by review team - Criteria suggested by review team - Review report prepared by review team
3. Review of subprojects	Preliminary approval of subproject programs prepared by MOE - Formal approval of subprojects by Education Loan Planning and Management Committee
4. Decision on subprojects	Final decision on subprojects - Approval of subprojects up to $2,500,000 by MOE, or - Approval of subprojects over $2,500,000 by IBRD - Overall review and approval of subprojects by IBRD - Approval notification to project schools by MOE

3.05 Eligibility Criteria and Investment Guidelines. The Ministry notified potential project institutions and received subproject proposals, including plans regarding student quotas, development of professors, development of curricula, finance for expansion of facilities, repayment plan (only for private institutions), and management and implementation of the project. The investment criteria and the general guidelines were as follows:

(a) Engineering Education

(i) Investment criteria:

- Staff development program of professors
- Improvement of laboratory and workshop equipment
- Upgrading quality of engineering education
- Program for development of graduate level education and research
- Improvement of educational equipment

(ii) Investment guidelines:

- Should aim at improving quality of education
- 80% of the investment should be allocated for laboratory and workshop equipment
- In the case of private institutions, counterpart funds equal to their subloans should be secured and invested for improvement of engineering education
- Each department should have five full-time professors and more than 40 students as admission student quotas
- Preference is given to common use laboratory equipment

(b) Technician Education

(i) Investment criteria:

- Expansion of laboratory and workshop equipment for junior technical colleges
- Development of professors and research assistants
- Research and development of curricula and educational aids
- Founding and operating a technician education research center

(ii) Investment guidelines

- Student quotas of junior technical colleges in the 1978 school year will be used as a basis for planning
- Purpose of investment is to upgrade the quality of education
- Investment will concentrate on heavy and chemical industry departments
- Investment will concentrate on the expansion of laboratory and workshop equipment
- Operation committee of junior technical colleges will be established
- Preference is given to equipment commonly used by students.

3.06 The World Bank appraisal team also proposed investment guidelines which were adopted:

(a) Investment will be made for upgrading the quality of the traditional colleges of engineering and junior technical colleges rather than of newly founded colleges;

(b) Colleges of business administration should have five professors or more and 20 or more students for graduate courses, and the number of students per teacher should be lower than 120;

(c) Further subdivision of the current disciplinary departments at colleges of engineering is controlled;

(d) Junior technical colleges are required to have 20 professors or more and 500 students or more.

3.07 Evaluation Procedures. Officials of the EFB reviewed subproject applications, and together with the evaluation committees visited project institutions to appraise the subprojects. The main items evaluated were:

(a) Development plan for teaching staff;

(b) Laboratory and workshops and plans for new or supplemental construction;

(c) Curricula, syllabi, and schedule of laboratory and practical work;

(d) Plans for assigning assistants for laboratory and practical work;

(e) Number of professors and students by department;

(f) Plan for common use of laboratory and workshop equipment;

(g) Inventory of laboratory and workshop equipment and related cost for maintenance and operation;

(h) Capacity and plan for loan repayment.

Final evaluation was carried out by MOE's Deliberation Committee, chaired by the Assistant Minister, Office of Planning and Coordination and by EPB's Planning and Management Committee, which consisted of officials in the related ministries.

Allocation of the Loan

3.08 The allocation compared with actual disbursement of the loan proceeds as of February 1986 is given in Table 3.2.

Table 3.2: LOAN ALLOCATION, APPRAISAL VS. ACT.
(Unit: US$ '000)

Classification	Appraisal estimates					Actual disbursement			
	Project institutions	Equipment	Non-facilities	Unallocated	Total	Project institutions	Equipment	Non-facilities	Total
Engineering	28	47,000	7,000	6,000	60,000	33	57,075	7,206	64,281
Technician	27	28,000	4,000	4,000	36,000	26	27,627	3,934	31,561
Management	-	-	4,000	-	4,000	-	-	4,013	4,013
Total	55	75,000	15,000	10,000	100,000	59	84,702	5,153	99,855

3.09 Allocation Guidelines. MOE adopted allocation guidelines recommended by the IBRD appraisal team including:

(a) 20% to 50% of the loan would be allocated for graduate courses;

(b) One third or more of the subprojects of the loan allocation would be allocated to private institutions;

(c) The size of the subprojects would range from a minimum of US$500,000 to a maximum 10% of the total allocation to the same field;

(d) No more than half the loan funds would be for institutions in the Seoul area.

3.10 Allocation to Colleges of Engineering. The KEEB at first selected 27 colleges of engineering as project institutions; in addition, 5 colleges of engineering, 1 national and 4 private, applied for participation and 32 colleges of engineering in all were selected as project institutions (Table 3.3). In allocation of the loan, US$46,930,000 were allocated in October 1980 but this was increased to US$57,075,000, covering some 8,374 items of laboratory and workshop equipment.

Table 3.3: ALLOCATION OF THE LOAN FOR ENGINEERING EDUCATION

Foundation/ Institution	Original allocation				Actual disbursement	
	Initial allocation	Contingencies	Additional allocations	Subtotal	No. of Items	Amount (US$ '000)
	(US$ '000)					
National Univ.						
Seoul	6,400	200	-	6,600	778	7,075
Pusan	2,130	200	60	2,390	363	2,737
Kangwon	1,140	750	100	1,990	367	2,044
Chungbuk	1,250	650	60	1,960	484	2,168
Chungnam	1,730	260	50	2,040	302	2,036
Jeonbuk	2,230	260	89.57	2,579.57	387	2,582
Jeonnam	1,920	656	60	2,636	473	2,826
Gyeongbuk	1,930	400	50	2,380	256	2,416
Gyeongsang	-	900	60	960	229	948
Jaeju	-	-	-	-	81	257
MOE	-	-	-	-	-	38
Subtotal	18,730	4,276	529.57	23,535.57	3,720	25,127
Private Univ.						
Korea	2,800	-	-	2,800	447	2,728
Yonsei	3,120	600	-	3,720	534	3,723
Inha	2,430	100	-	2,530	253	2,408
Sungjun	-	600	60	660	43	656
Konkuk	890	-	-	890	93	860
Kyunghee	1,050	-	-	1,050	50	1,030
Dankuk	1,010	100	-	1,110	218	1,004
Dong-a	1,420	-	-	1,420	136	1,371
Sungkyunkwan	1,260	300	-	1,560	262	1,535
Yeongnam	1,450	-	-	1,450	382	1,428
Wonkwang	880	-	-	880	172	878
Chosun	1,150	-	-	1,150	58	1,135
Chungang	910	-	-	910	190	862
Hanyang	3,740	300	-	4,040	546	3,945
Hongik	1,000	-	-	1,000	112	953
Kyungnam	780	300	-	1,080	218	1,075
Myungji	950	-	-	950	144	910
Ajou	1,240	-	-	1,240	214	1,201
Ulsan Inst of Tech	1,460	-	-	1,460	214	1,437
Korea Avn Coll	660	-	-	660	133	633
Gwangeun Engr. Coll.	-	800	100	900	87	890
Kukmin	-	500	60	560	72	545
Dongkug	-	700	60	760	76	741
Subtotal	28,200	4,300	280	32,780	4,654	31,948
Total	46,930,000	8,576	809	56,315	8,374	57,075

3.11 Allocation to Public Junior Technical Colleges. The Ministry allocated US$27.6 million to equipment for junior technical college programs. The above amount was divided and allocated at 40% for national and public junior technical colleges and 60% for private junior technical colleges. Originally, 27 junior technical colleges were selected. Four private junior technical colleges withdrew, but three additional private colleges applied for participation. The final allocation to junior technical colleges was US$27,627,000 for 8,744 equipment items (Table 3.4).

Table 3.4: ALLOCATION OF THE LOAN FOR JUNIOR TECHNICAL COLLEGES

Foundation/ Institution	Original allocation				Actual disbursement	
	1st allocation	Reallocation of Contingencies	2nd allocations	Total	No. of Items	Amount
	(US$ '000)					(US$ '000)
National Univ.						
Gyeonggi Open	-	-	130	130	112	126
Pusan J.T.C.	2,527	300	-	2,827	538	2,751
Chungjoo	2,312	230	-	2,542	790	2,460
Daejeon	2,094	430	-	2,524	782	2,538
Samcheock	1,897	290	-	2,187	910	2,096
Chunan	800	350	-	1,150	362	1,131
Subtotal	9,630	1,600	130	11,360	3,494	11,102
Private Univ.						
Hongik J.T.C.	1,009	-	-	1,009	172	958
Dongyang J.T.C.	796	-	-	796	159	782
Kyungnam	1,040	-	-	1,040	305	965
Dongeou	827	-	-	827	199	742
Pusan	725	-	-	725	429	687
Dongwon	1,066	-	-	-	-	-
Inha	1,213	-	-	1,213	215	1,163
Incheon	920	-	-	920	301	876
Daerim	863	-	-		-	-
Suwon	745	-	-	745	100	724
Yuhan	762	-	-	762	443	729
Osan	599	-	-	-	-	-
Bucheon	559	100	-	659	347	632
Gyungwon	623	-	-	623	297	593
Chungkyung	500	-	-	500	191	470
Chunjoo	787	200	-	987	190	961
Chosun	1,214	-	-	1,214	221	1,161
Kyungbuk	975	-	-	975	291	954
Yungnam	1,048	-	-	1,048	307	1,004
Yungjin	805	-	-	805	365	756
Ulsan	632	-	-	632	311	617
Daeyoo	(700)	-	-	700	154	640
Induck	(564)	-	-	564	167	535
Daegu	(520)	-	60	580	86	576
Kyungnam	719	-	-	-	-	-
Subtotal	18,427	300	60	17,324	5,250	16,525
Total	28,057	1,900	190	28,684	8,744	27,627

3.12 Allocation for Nonfacilities Programs. The nonfacilities programs consisted of overseas training of professors, employment of Korean scholars living overseas and foreign consultants, and purchase of materials and other publications. The estimated cost of these programs was US$15 million: US$7 million for engineering, US$4 million for business management, and US$4 million for technician education. The planned and actual disbursements under these programs are given in Table 3.5.

Table 3.5: ALLOCATION OF LOAN FOR NON-FACILITIES PROGRAMS

Classification	Investment	Appraisal estimate		Actual achievement	
		Quantity (man-years)	Amount (US$'000)	Quantity (man-years)	Amount (US$'000)
Engineering	Overseas study of professors	467	6,356	472	6,078
	Invitation of overseas Korean scholars	100	644	106	536
	Others	-	-	-	592
Subtotal		567	7,000	578	7,206
Management	Overseas study of professors	152	1,340	139	1,378
	Overseas training of professors	100	2,460	82	2,428
	Documents, papers	-	200	-	207
Subtotal		252	4,000	221	4,013
Technician	Consultant services	15	434	16	382
	Overseas training of professors	450	1,392	448	2,392
	Domestic training of professors	-	-	3,008	68
	Research of education	240	1,394	239	769
	Purchase of materials	-	780	9,927	323
Subtotal		705	4,000	13,638	3,934
Total		1,524	15,000	14,437	15,153

Training of Teaching Staff

3.13 The plan for upgrading the quality of teaching staff was as follows:

(a) Engineering education. The KEEB proposed ways to upgrade the quality of teaching staff through:

(i) Assistance to increase the proportion of professors holding doctorates from 38% in 1979 to 43% by 1986;

(ii) Expansion of overseas training of professors and support for them to participate in foreign international meetings;

(iii) Expansion of research activities by and support to professors in industrial fields;

(iv) Support for retraining of professors; and

(v) Assistance to professors to participate in training programs for technical manpower in industry.

(b) Management Education. The current problems in management education include lack of qualified professors and curricula. The increased demand for managerial manpower in industry has caused the loss of good professors to industry. Proposed ways to upgrade quality of teaching staff included retraining of teaching staff, short-term overseas training, and raising the ratio of professors holding doctorates.

(c) Technician Education. The Korea Technician Education Evaluation Committee proposed ways to train teaching staff as follows:

(i) Local training of 3,400 professors of junior technical colleges for 66 hours;

(ii) Overseas training of 250 professors of junior technical colleges for one year;

(iii) Overseas training of 50 research assistants or research technicians; and

(iv) Invitation of 30 foreign consultants.

3.14 Selection of Trainees. The sector program supported overseas training of professors for engineering, management, and technician education. In colleges of engineering, overseas training of professors were in the fields of mechanical, electrical, electronics, chemical, architectural, civil, metallurgical and industrial engineering. The criteria for selection of trainees were: should hold a doctorate, be aged less than 50, possess foreign language proficiency, and be willing to work for more than three years after return from training. The distribution of selected candidates was one among 11 professors for national colleges of engineering, one among 18 professors in

the case of private colleges of engineering, and one among 15 professors for all colleges of engineering. The planned versus actual achievement in training is shown in Table 3.6.

Table 3.6: PLANNED AND ACTUAL TRAINING OF PROFESSORS IN ENGINEERING

Years	Planned (man-years)	Actual (man-years)
1980	100	97
1981	100	98
1982	100	120
1983	167	157
Total	467	472

3.15 In management education, the purpose of overseas training of professors was to introduce management theory from advanced countries, stimulate development of management education, and contribute to improvement of management through education-industry cooperation. The countries selected for training were the USA and European countries and training places were major universities or research institutes. The major fields of the trainees included accounting, international economics, staffing of industries, marketing, quantitative management, and financing. The criteria for selection of trainees were: should be under the age of 50, have linguistic ability, have research experience of not less than five years, and be full-time teaching staff with three or more years of teaching experience. The of overseas training of management professors is shown in Table 3.7.

Table 3.7: PLANNED AND ACTUAL OVERSEAS TRAINING OF PROFESSORS IN MANAGEMENT EDUCATION

Years	Plan (man-years)	Actual (man-years)
1980	20	19
1981	30	28
1982	40	37
1983	62	55
Total	152	139

3.16 The purpose of training for professors of junior technical colleges was mainly to expose them to technician education in the industrially advanced countries. The majority of trainees, 235, went to the USA for training; others went to Japan, West Germany, and the United Kingdom. The training periods were from three months to one year. The implementation of overseas training is shown in Table 3.8.

Table 3.8: PLANNED AND ACTUAL OVERSEAS TRAINING FOR PROFESSORS OF JUNIOR TCECHNICAL COLLEGES

Years	Plan (man-years)	Actual (man-years)
1981	204	89
1982	132	141
1983	114	152
1984	-	66
Total	450	448

Government Compliance with Covenants

3.17 Approval of Subprojects. Section 3.05 of the Agreement provided that the Borrower was to implement subprojects in accordance with guidelines and criteria agreed upon between itself and the Bank. Therefore, subprojects over $2,500,000 in amount were approved by the Bank in advance and implemented. Seven subprojects in this category were approved by the Bank during July 23 to October 10, 1980. They are shown in Table 3.9.

Table 3.9: BANK APPROVAL OF SUBPROJECTS

Non-facility category		Equipment category	
Programs	Amount ($'000)	Programs	Amount ($'000)
• Overseas training program of professors in engineering field	5,700	Subprojects of:	
		• Seoul National Univ.	6,400
		• Yonsei Univ.	3,100
• Overseas training of professors in management field	3,000	• Korea Univ.	2,800
		• Hanyang Univ.	3,700
		• Busan Jr. Tech. Coll.	2,500
Subtotal	8,700		18,500

3.18 Improvement of the Committee of Manpower Development and Promotion. The Agreement provides in Section 3.06 that the Borrower is to evaluate, not later than January 30, 1980, the Committee for Manpower Development and Promotion within the Economic Planning Board and ensure that it performs, not later than December 31, 1981, the functions of a manpower monitoring system. The Economic Planning Board organized a manpower coordination monitoring system and a task force in compliance with Section 3.06 of the Agreement on March 5, 1981. The Manpower Monitoring Committee was to hold meetings once a year or more, and the Task Force was to meet two times or more a year.

3.19 The Manpower Monitoring Committee was organized with the Vice-minister of EPB as chairman, Vice-ministers from the Ministry of Education, Ministry of Commerce and Industry, Ministry of Construction, Ministry of Science and Technology, Director General of Labor Administration, Assistant Minister of EPB for planning, and the 2nd Administration Coordinator, Office of Administration Coordination, and Office of the Premier, seven persons in all.

3.20 The Task Force for manpower monitoring was composed of the Assistant Minister of EPB for planning, as leader, and as members, the Director General of Bureau Planning of EPB, Director General of Higher Education Bureau, and Director General of Nonformal and International Education Bureau, MOE, Guidance Officer of Enterprises, Ministry of Commerce and Industry (MOCI), Director General, Management Bureau, MOCI, Planning Officer of Manpower, MOST, Director General of Vocational Stabilization Bureau, Office of Labor Administration, and related officer of the 2nd Administrative Coordination, Office of Administration Coordination, Office of the Premier, nine persons in all. In 1984, EPB formalized this arrangement by establishing a Manpower Coordination Division.

3.21 Flexibility of the Student Quota System. Section 3.07 of the Agreement provides that the Borrower is to submit, not later than December 31, 1980, to the Bank, for its review and comments, proposals for a flexible allocation system for higher technical education which will facilitate adjustment of supply of higher technical manpower in accordance with changes in labor market demand. MOE arranged on March 11, 1981 to establish short-term and long-term plans for this purpose in the field of technician education, and also prepared recommendations for improvement for the fields of engineering and management education by May 31, 1981. The contents of the above short-term and long-term measures for technician education were to control increase of student quotas and allow junior technical colleges to decide student admission quotas by themselves, by department and by course, and thereby allow colleges flexibility in taking new transferring students and permitting changes of departments for students. The plans were reviewed by the Bank and were satisfactory.

3.22 Establishment and Operation of Education Research Centers. Section 3.08 of the Agreement provides that the Borrower should establish, not later than January 1, 1981, and thereafter maintain three accreditation agencies, in the fields of engineering, technician and management training to assess the

quality and relevance of higher technical education and training standards. Terms of references for the three accreditation agencies were approved by IBRD on September 13, 1980, and the three agencies were established on January 1, 1981. Their purpose, function, and performance are described in detail in paragraph 5.1.

3.23 Relaxing of Student:Teacher Ratio. Section 3.09 of the Agreement stipulates that the Borrower should take all necessary steps for recruitment and retention of teaching staff at graduate and undergraduate levels as might be required to achieve by December 31, 1986 student:teacher ratios of 21:1 for engineering education, 40:1 for management education and 18:1 for technician education at the undergraduate level; and 15:1 and 20:1, respectively, for engineering education and management education at the graduate level.

3.24 As of March 1985, the student:teacher ratios of the project institutions were 38.1:1 for engineering education at private institutions, 52:1 for that at national ones, 17.3:1 for national junior technical colleges, and 41.6:1 for private ones. Only that for national junior technical colleges was achieved. The failure to achieve the targets was a result of decisions to increase enrollments sharply in 1981 and 1982 and slower than expected progress is recruiting new faculty. The agreement was amended to postpone the deadline for achieving these targets to December 31, 1990.

3.25 Audit Reporting. Section 4.03 of the Agreement stipulates that the Borrower's Ministries and Agencies responsible for carrying out the Project should report to the Bank on audits conducted for the project every year within six months of the end of the government fiscal year. The MOE furnished Audit Reports three times to the Bank on September 26, 1983, August 21, 1984, and August 1985.

3.26 Support to Private Institutions. One of the main purposes of the sector loan was to upgrade private and local institutions. Pursuant to Section 4.04 of the Loan Agreement, MOE organized a study team during May to October 1980 for research on financial aspects of private institutions to upgrade their quality. The team recommended in its report to provide financial assistance of W 122,500 million for private colleges of engineering and W 92,100 million for private junior technical colleges.

3.27 The Government established a financial assistance plan for private colleges of engineering and private junior technical colleges in June 1981 in addition to the sector loan. The assistance fund was W 41,200 million for the 5-year period from 1982 to 1986, W 19,500 million for private colleges of engineering and W 21,700 million for private junior technical colleges. The assistance method was to secure the required funds every year in the government budget and apportion them as grant-in-aid.

3.28 The Government also planned to assist private institutions for three years from 1981 to 1983 with an amount of W 60,000 million for expansion of education facilities along with the introduction of the new graduate quota system. The approach for assistance was as follows:

(a) Arranging commercial lending of about W 20,000 million every year for three years

(b) Support facilities such as athletic halls and student union buildings might be built from the institution's own resources, but loan assistance will be arranged by the Government for construction of basic facilities such as laboratories and lecture rooms

(b) The loan assistance from private sources will be guaranteed by MOE, and the repayment period will be for 10 years after the 5-year grace period. One half of the interest will be borne by the Government.[6/]

Problems in Project Implementation

3.29 Problems in Implementation Procedures About two months elapse from receipt of shipping documents to delivery owing to complicated procedures in project institutions, the Ministry, and the procurement agency, OSROK. In addition, a period of about two years is required for equipment imported under foreign loans from allocation of the loan to installation of the equipment. Sometimes equipment which was the most modern at the time of request for purchase had become outdated by the time of delivery. Another phenomenon was that owing to price escalation during the project period, the quantity of equipment planned to be imported had to be reduced.

3.30 Too many papers were also required for customs clearance of equipment imported under the loan, namely import declaration, supply notice of import goods, shipping documents, recommendation for tax reduction, confirmation on use of goods to be imported, confirmation on use of goods imported, registration card of tax-reduced imported goods, copy of business license and others. A large-scale reduction in the amount of papers is recommended.

3.31 Problems in Selection and Usage of Equipment. Professors of project junior technical colleges have indicated that about 12% of the equipment imported under the project had low utilization rates.[7/] Such equipment falls into the following categories:

(a) Equipment rarely used in the curricula

(b) Equipment without proper accessories

(c) Equipment overly sophisticated and not used much

(d) Low quality equipment

6/ Lee, Kwan et al, May 1980, A study on Ways to Support Private Colleges of Engineering, p.85.

7/ The Education Loan Project Evaluation Team, 1983, A comprehensive Evaluation Report on Education Loan Projects, p. 241.

(e) Inadequate technician support and ability to operate equipment.

One cause of poor selection of equipment is that the Standard Lists of Equipment for education contained items that were obsolete. MOE revised the lists on July 1, 1983. However, by that time, some equipment selected from the old list had already been purchased. Other causes were problems involved in purchase through OSROK, limited experience with equipment, and insufficient information on the latest equipment.

3.32 Only 4% of equipment was found to be inappropriate in the case of colleges of engineering, according to a survey.[8/] The problems were:

(a) Inadequate accessories or attachments
(b) Redundancy in some items
(c) Equipment too costly to operate.

Causes of these problems were the same as those for junior technical colleges.

3.33 Regarding utilization of equipment in colleges of engineering, 83.6% was evaluated to be good or very good. Causes of poor utilization were mostly equipment without accessories, equipment requiring more technicians than were available, and insufficient funds for operation and maintenance.[9/] The most serious problem in usage of equipment in colleges of engineering and junior technical colleges is lack of accessories and operation technicians, especially in the case of high priced and sophisticated equipment. Generally, graduate students or research assistants act as technicians, but they are incapable of providing adequate maintenance.

3.34 As the amount of technical equipment increased, owing to long use and obsolescence of equipment imported under education loan projects since 1969, MOE established a mobile equipment maintenance center attached to the Gyeonggi Open University in June 1983. For purposes, detailed operations, and effectiveness of the center, see para. 5.21.

Implementation of a Sector Program

3.35 Comparison of a Sector Loan to a Project Loan. In this sector program, the options and flexibility of the borrower in processing subprojects were expanded, but at the same time its responsibility was increased. Differences between a sector loan and a project loan are shown as follows:

8/ The Education Loan Project Evaluation Team, 1983, A comprehensive Evaluation Report on Education Loan Projects, p. 264.

9/ The Education Loan Project Evaluation Team, MOE, 1983, A Comprehensive Evaluation Study on the Education Loan Projects, p.265.

Table 3.10: SECTOR LOAN COMPARED WITH PROJECT LOAN

	Project loan	Sector loan
1. Subject of loan	Project	Sector
2. Main concern	Feasibility of a certain project	Sector policy issues and a comprehensive development plan.
3. Project evaluation and loan decision	The borrower plans a project unit Loan is decided after IBRD appraises loan project	The borrower establishes a management organization. A comprehensive plan is established. Detailed subprojects are decided by the management organization after review and evaluation.
4. Management and control of project implementation	IBRD is directly involved in review and control of project implementation	IBRD participates in overall review only and subprojects are managed and controlled by the borrower's project management agency.

3.36 The process of a sector loan is: first, the borrower focusses on a certain sector such as engineering education, establishes a comprehensive development plan for solving problems in the sector, and assists and implements the plan. Second, MOE agrees with IBRD on basic principles required for implementation of the program, such as criteria for selection of subproject institutions, general guidelines for allocation of loan proceeds and other major subjects for implementing the program, and special functions are handed over to the borrower such as evaluation and control executed by IBRD in traditional project loans. Detailed matters are decided and implemented directly by the MOE for a speedy execution of the program. Local professional experts are utilized by the borrower. Project planning, related evaluation, and implementation are conducted in the way most suitable to local conditions through participation by local experts in all project implementation steps.

3.37 Managerial Capability of Borrower. According to experience with implementation of the sector program, the borrower should have the ability to manage this kind of program, including:

(a) Decision making and policy making ability through committees or other forums;

(b) Administrative ability for financing, staffing, auditing, and technical matters;

(c) Professional skills in preparing for project implementation, review of subprojects, giving guidance to project institutions, and processing subprojects.

3.38 Bank Role. The role of IBRD in the sector program may be summarized as follows:

(a) Act as catalyst in the creation of the institution administering the sector loan;

(b) Analyze and discuss with the country problems and strategies for the sector;

(c) Suggest and discuss criteria for selecting subprojects;

(d) Approve subprojects;

(e) Review progress periodically with borrower;

(f) Train borrower's staff.

3.39 An advantage of a sector loan is that the project implementation can progress speedily without most of the approval and procedures needed for a traditional project. The program is effectively processed by participation of local professional experts and committee members whose cooperation and consultation could be easily obtained when required through their visits to project institutions and discussions. On the other hand, there is a heavy workload on the side of the borrower, which may be called a shortcoming.

4. PROJECT COSTS

Estimated and Actual Project Costs

4.01 The Government projected the total cost of the sector program for 1978 to 1983 at US$700 million. The investment components were US$270 million for national colleges of engineering, US$270 million for private colleges of engineering, and US$160 million for the non-facility programs. Of the total project cost, IBRD financed US$100 million, or 14% of the total cost, the Government provided US$370 million of the investment at 53%, and private institutions US$230 million at 33%. Actual project costs in US dollars amounted to US$627 million as shown in Table 4.1. This represents a 10% underrun due to devaluation of the won. Actual costs in won amounted to W 483 billion, 42% more than appraisal estimates.

Table 4.1: OVERALL FINANCING, APPRAISAL ESTIMATES VS. ACTUAL
(US$ '000)

	Appraisal Estimate					Actual Costs				
	Government	Private	Proposed IBRD Loan	Total	% IBRD Financing	Government	Private	IBRD Loan	Total	% IBRD Financing
Public	370	-	60	430	14%	243		52	295	18%
National	140		20	160	13%	90		15	105	14%
Subproject	230		40	270	15%	153		37	190	19%
Private-Subproject		230	40	270	14%		284	48	332	14%
Total	370	230	100	700		243	284	100	627	
% Total	53%	33%	14%	100%		39%	45%	16%	100%	

Disbursement

4.02 The planned and actual disbursement of the loan is shown in Table 4.2. Disbursement was made for purchase of laboratory and workshop equipment at 85% of the total loan, implemented on the basis of subprojects, and for nonfacility programs at 15% on a national basis.

Table 4.2: DISBURSEMENT, APPRAISAL ESTIMATES VS. ACTUAL

Category	Appraisal estimates (US$'000)	Actual disbursement (US$'000)
1. Equipment purchase		
. Equipment for engineering education	47,000	57,075
. Equipment for technician education	28,000	27,627
Subtotal	75,000	84,702
2. Non-facilities programs		
. Engineering education	7,000	7,206
. Technician education	4,000	3,934
. Management education	4,000	4,013
Subtotal	15,000	15,153
3. Contingencies	10,000	
Total	100,000	99,855

4.03 Rate of Disbursement. The planned and actual disbursement rates of the loan proceeds are shown in Table 4.3. The closing date of the loan was June 30, 1984, but it was extended by one year to June 30, 1985.

Table 4.3: DISBURSEMENTS RATES, APPRAISAL ESTIMATES VS. ACTUAL

Year	Appraisal estimates (US$ '000)	Actual (US$ '000)
1980	-	463
1981	16,000	2,050
1982	37,000	33,488
1983	29,000	40,161
1984	18,000	20,472
1985	-	3,221
Total	100,000	99,855

5. ACHIEVEMENT OF THE PROJECT

Korea Engineering Education Board

5.01 The Board was established in May 1980, and its functions were as follows:

(a) Evaluation and consultation on planning and implementation of the sector program;

(b) Planning the development of an accreditation method and conducting accreditation

(c) Consultation on studies and planning for education quality improvements

(d) Collecting, filing, recording and analyzing materials on engineering education

(e) Studies and consultation on matters requested by MOE.

The Committee was organized with one chairman, 15 members, consultants, professional experts, and secretarial staff. The Committee was supported by the College Finance Division, College Education Bureau, and Foreign Capital Project Division, Education Facilities Bureau, MOE, para. 5.02. The main work conducted by this Committee was as follows:

(a) Evaluation of engineering education programs in general and specifically of subprojects considered for financing under the sector program;

(b) Evaluation of the overseas training plan for professors of colleges of engineering, including the selection of trainees and training organizations.

(c) Studies and workshops on development of engineering education and ways to raise the quality of higher technical education;

(d) Establishment of minimum standards for engineering education and evaluation of colleges of engineering against those standards.

5.02 The Board spent about W 90 million in total for implementation of the above programs as shown in Table 5.1.

Table 5.1: DISBURSEMENT FOR KOREA ENGINEERING EDUCATION BOARD
(Unit: W 1,000)

Year	Fund for research	Evaluation	Program reviews	Operating cost	Subtotal
1980	9,000				9,000
1981	20,000				20,000
1982	16,819	6,591	14,267	4,166	41,843
1983	5,543		5,000	4,246	14,789
1984	4,000		400	260	4,660
Total	55,362	6,591	19,667	8,672	90,292

Korea Management Education Board

5.03 The Board was established in February 1980 and its objectives were to produce:

(a) Plan of overseas studies by professors
(b) Development plan of management case studies
(c) In-service training plan for teaching staff
(d) Overall evaluation of management education
(e) Curriculum development plan.

The Committee consisted of one chairman, 15 members. It was chaired by the Dean of College of Business Administration, Seoul National University.

5.04 The Committee was responsible for the overseas training program for management education under the sector programs. In total 100 trainees were sent for short-term training and 82 doctoral students were sent to the US, Germany, England and France. The Committee also organized the publication of literature on developing curricula at colleges of business administration in the US, gathered documents and papers of business management, and held seminars on business management.

Technician Education Evaluation Committee

5.05 The Committee consisted of one chairman and eight committee members, under the Junior College Administration Division, Nonformal and Vocational Education Bureau, MOE. The Committee's achievements included:

(a) Establishment and operation of the Technical Education Research Institute (TERI);

(b) Managing overseas training program, including selection of trainees among professors of junior technical colleges and training institutions;

(c) Studies on ways to improve technician education, drawing experience from the countries;

(d) Planning development of curricula for junior technical colleges; and

(e) Accreditation of junior technical colleges.

5.06 Accreditation of junior technical colleges was in accordance with Clause 7 of the Regulation for the Policy Consulting Committee in the Ministry and Article 3.08 of the Loan Agreement, and was based on the colleges' ability to plan and achieve educational objectives, the curricula, number of professors, status of educational facilities, amount of laboratory and practical, and field training, counseling on placement, management capacity, and financial management. The evaluation reports of the accreditation team contained suggestions for improvement to each junior technical college and provided relevant materials and information. Accreditation was conducted on 144 institutions from 1980 to 1983 (Table 5.2.).

Table 5.2: ACCREDITATION OF JUNIOR TECHNICAL COLLEGES

Years	Evaluation members	Subject institutions	Period of evaluation
1980	12	39	80.11.10 - 11.22
1981	12	36	81.10.26 - 11.20
1982	12	36	82.11.08 - 11.30
1983	9	33	83.10.10 - 11.04
Total		144	

Development of Curricula

5.07 The KEEB has categorized functions of colleges of engineering into the following three models of technical education:

(a) Model A: emphasis on earlier adaptation to the industrial field
(b) Model B: emphasis on better management
(c) Model C: emphasis on engineering theories.

An engineer in the industrial field should: first, have the ability to meet production requirements in fields such as design, management, operation, tests, construction, and sales; second, be able to take charge of research and development activities; and, third, have the ability to manage and operate large-scale industries. The Board proposed the above-cited models as there was no way to produce engineers under a uniform educational method. The curriculum components in the three models are shown in Table 5.3 and 5.4.

Table 5.3: THE THREE MODEL CURRICULUM COMPONENTS FOR ENGINEERING EDUCATION
(Unit: %)

Subject	Model A	Model B	Model C
Mathematics	10	12	12
Basic sciences	10	10	13
Basic engineering	28	32	31
Humanities, social sciences and communication	17	20	12
Majors, elective majors and general electives	35	26	32
Total	100	100	100

Table 5.4: CURRICULA OF COLLEGES OF ENGINEERING BY MODEL

Subjects	Model A	Model B	Model C
Mathematics	• Analytical geometry • Differential equation	• Statistics • Computer	• Analytical geometry • Differential equation • Numerical analyses • High level mathematics
Basic sciences	• To take one of physics, chemistry, biology, or earth science	• To take one of physics, chemistry, biology, or earth science	• Physics, chemistry, biology, earth science
Basic engineering	• Industrial drawing and survey • Plant operation and maintenance • Measurement technics • Electronics circuit • Labor law, cost accounting	• Production engineering • Economic engineering • Operation research	• Engineering design • Systems engineering • Subjects bridging to engineering • Development of creativeness
Humanities and social sciences	• Communication • Mother tongue, cultural history, social science, athletics, military training	• Industrial laws, and regulations • Communications	• Philosophy, religion, history, literature, psychology, economics
Major subjects	• Subjects required for professional engineering education • Subjects to meet demands of the industrial society	• Marketability prospect • Plant design • Quality control • Financial management	• Subjects for training high technical manpower • Subjects agree with requirements by the technical society

Source: Korea Engineering Education Board, 1982, the Minimum Standard for Education of Quality Engineering, p. 32-44.

Establishment of Technician Education Research Institute

5.08 TERI was established on July 1, 1980 as an organization attached to the Geonggi Open University. The Institute comprised four departments: planning and management, training, education and research, and evaluation and management. The Department of Planning and Management was in charge of invitation to consultants and professional experts, promotion of policy studies, operation of TERI, and promotion of research for technical education. The Department of Training was responsible for domestic training of professors, and planning and implementation of overseas training. The Department of Education and Research was in charge of the development of technician education curricula. The Department of Evaluation and Management conducted regular evaluation of technician education facilities and contents of education, made recommendations subsequent to evaluation results, and evaluated project planning under the Loan Agreement.

5.09 The main activities of the four departments were as follows:

(a) The Department of Planning and Management hired 16 consultants and technical experts: four for consultation on the sector program, eight for improvement of education, and four for electricity, electronics and computer systems. Four were Koreans, nine from the US, and six from England. Studies on policy issues conducted during the project period included ways to upgrade junior technical colleges in Korea in comparison with community colleges in the US and polytechnics in the UK, revision of the Standard Equipment Lists for laboratory and practical training at junior technical colleges; and education-industry cooperation. It also conducted accreditatior on junior technical colleges.

(b) The Department of Education and Training organized in-country and overseas training for some 3,456 professors of junior technical colleges and open universities. The purpose of their training included studying the most advanced techniques in their fields, acquiring ability to develop educational materials, management and operation of an effective instruction and learning process, and learning about technical education in advanced countries. The number of trainees is given in Table 5.5

Table 5.5: TRAINING OF TEACHING STAFF OF JUNIOR TECHNICAL COLLEGES

Training	1980	1981	1982	1983	1984	Subtotal
Overseas training (long-term)		35	105	95	30	265
Overseas training (short-term)		54	36	57	36	183
Local training	209	698	691	1,206	204	3,008
Total	209	787	832	1,358	270	3,456

(c) The Department of Education and Research was responsible for the development of curricula, and the second for development of curricula, textbooks, and modules. It organized a symposium for the development of curricula.

Through 107 case studies from 1981 to 1983, it developed the curricula for welding, automobile, refrigerator, communication equipment, computer courses, industrial chemistry, architecture, civil engineering, mechanical drawing, solar energy, food industry, environment, liquidity, metallurgy, electrical installation, ceramics, industrial design, communication, airport operation, industrial installations, ship-building, metallic artworks, and railroad equipment. Text materials suitable for education at junior technical colleges were also developed for 76 fields.

Recruitment of New Teaching Staff

5.11 The teaching staff for engineering, management, and technician education were projected to triple from 3,900 in 1979 to 12,000 in 1986, according to the IBRD Staff Appraisal Report. The criteria for recruitment of new teaching staff at that time were that the increase of teaching staff to 12,000 was required for achieving student:teacher ratios of 21:1 for engineering, 40:1 management, and 18:1 for technician courses. As shown in Table 5.6, these targets were not reached. The deadline for achieving them were revised to December 31, 1990 by an amendment letter to the Loan Agreement dated June 14, 1984. The reasons for the failure to achieve these ratios were that the increase in teaching staff was only about 40% of appraisal target while enrollment increase exceeded original projections.

Table 5.6: STUDENT:TEACHER RATIOS

Field	Teaching staff	Students	Student:teacher ratio Current	Goal for 1990
Technician	3,274	78,360	24:1	18:1
Engineering	3,082	114,000	36:1	21:1
Management	669	34,280	51:1	40:1
Total	7,025	226,640	32:1	-

Source: Quarterly Report (March 31, 1985)

Expansion of Graduate Courses

5.12 One of the ways to produce new teaching staff was to expand graduate courses and upgrade their quality. The numbers of new students and graduates of master's and doctor's degree courses for engineering in 1980 compared with those in 1984 are shown in Table 5.7.

Table 5.7: GRADUATE ENGINEERING COURSES FOR MASTER'S AND DOCTOR'S DEGREES (Unit: person)

Foundation	Project inst.	Master's course Admitted 1980	Master's course Admitted 1984	Master's course Graduates 1980	Master's course Graduates 1984	Doctor's course Admitted 1980	Doctor's course Admitted 1984	Doctor's course Graduates 1980	Doctor's course Graduates 1984
National	9	994	1,158	330	1,004	167	285	33	99
Private	22	1,158	2,070	530	1,325	170	353	32	102
Total	31	2,379	3,228	860	2,329	337	638	65	201
Growth rate		100	136	100	271	100	189	100	309

5.13 Scholarships were awarded to graduate students of engineering as part of quality upgrading of graduate education. The number and amount of scholarships awarded in 1980 and 1984 are shown in Table 5.8. The number of scholarships was increased from 2,597 in 1980 to 3,548 in 1984 and the amount of scholarship per student was increased from W 291,000 in 1980 to W 390,000 in 1984.

Table 5.8: SCHOLARSHIPS AWARDED FOR GRADUATE ENGINEERING EDUCATION

Foundation	Project inst.	1980 Students	1980 Amount (Won)	1980 Amount per student (Won)	1984 Students	1984 Amount (Won)	1984 Amount per student (Won)
National	8	1,268	370,870	292	1,660	462,654	279
Private	21	1,329	385,492	290	1,888	921,201	488
Total	29	2,597	756,362	291	3,548	1,383,855	390

Sources: Materials from project institutions.

Improvement of Staff Qualifications

5.14 To upgrade the quality of teaching, staff of engineering, management, and technician courses were encouraged to acquire higher degrees. The academic qualifications of professors at project institutions in 1980 and 1985 are shown in Table 5.9. The goal was to increase the proportion of professors of engineering education with doctor's degrees to 43% of total teaching staff by 1986, but as of March 1985, the ratio achieved was 53.9%. The goal for teaching staff with masters' degrees at junior technical colleges was 70%, but as of March 1985 the proportion was 86%.

Table 5.9: PROFESSORS WITH ACADEMIC DEGREES

Foundation	1980 National	1980 Private	1980 Total	1980 Ratios	1985 National	1985 Private	1985 Total	1985 Ratios
Engineering Education								
Doctor's	211	436	647	39.5	416	804	1,220	53.9
Master's	252	576	828	50.6	282	685	967	42.7
Bachelor's	35	96	131	8.0	20	53	73	3.2
Others	29	2	31	1.9	0	3	3	0.2
Subtotal	527	1,110	1,637	100.0	718	1,545	2,263	100.0
Technician Education								
Doctor's	1	4	5	0.3	10	41	51	2.6
Masster's	155	780	935	54.2	373	1,331	1,704	86.0
Bachelor's	173	585	758	43.9	54	152	206	10.4
Others	14	14	28	1.6	8	13	21	1.0
Subtotal	343	1,383	1,726	100.0	445	1,537	1,982	100.0

In-service Training for Professors

5.15 One indication of the quality improvement of teaching staff is that research publications in the engineering field conspicuously increased during the project period, and some have been published in international periodicals.[10/] Research projects conducted by professors in project institutions increased from about 1,900 in 1980 to 13,000 in 1984.

Placement of Graduates

5.16 Graduates from colleges of engineering may be placed in industry, public organizations, military service, or graduate education programs. The employment of graduates in 1980 compared with that in 1984 is shown in Table 5.10. The employment ratio of graduates, including those who were recruited to the military service or advanced to higher institutions, was 84.4% in 1980 and 78.3% in 1984 in the case of engineering education. The reason for the lower employment ratio was that the number of engineering graduates increased by 72% during the period. At the same time, the economy was depressed. The employment of graduates from junior technical colleges increased from 81.9% in 1980 to 84.8% in 1984. These results are obtained at the time of graduation. Undoubtedly employment could be higher following a period of job search.

Table 5.10: PLACEMENT OF GRADUATES FROM PROJECT INSTITUTIONS

Field/ Foundations	Project insts.	1980 Graduates	1980 Employed	1980 Employment ratio	1984 Graduates	1984 Employed	1984 Employment ratio
Engineering							
National	9	2,941	2,563	87.2	4,583	3,893	84.9
Private	23	9,517	7,954	83.6	16,936	12,964	76.6
Subtotal	32	12,458	10,517	84.4	21,519	16,857	78.3
Technician							
National	5	3,287	2,606	79.3	2,943	2,337	79.4
Private	21	21,984	18,027	82.3	22,435	19,193	85.5
Subtotal	26	25,181	20,633	81.9	25,379	21,530	84.8

Note: "Employed" includes those with the Millitary Services, advanced to higher institution, industries, public agencies, and own business.

Source: Material from project institutions.

10/ Ministry of Education, 1984. Impact of IBRD loans on Development of Education in Korea, (Joint Symposium by MOE and IBRD), Pg. 75.

Expansion of Education Facilities

5.17 Availability of Laboratory and Practical Training Facilities. A comparison of the availability of laboratories and practice rooms at colleges of engineering in 1980 and in March 1985 is shown in Table 5.11. The table shows that laboratories and practice rooms increased in area from those in 1980 and reached 71% of requirements.

Table 5.11: AVAILABILITY OF LABORATORY AND PRACTICE ROOMS
Unit: m^2

Field/ Foundations	Project insts.	Space	1980 Requirement	1980 Availability	1980 Availability ratio	1985 Requirement	1985 Availability	1985 Availability ratio
Engineering								
National	9	Rooms	1,024	742	72.5	1,153	925	80.2
		Area	117,256	72,368	61.7	159,422	92,588	58.1
Private	20	Rooms	1,249	1,172	94.0	1,421	1,698	119.5
		Area	225,068	127,837	56.8	266,576	208,688	78.3
Subtotal	29	Rooms	2,273	1,914	85.5	2,575	2,623	99.0
		Area	342,324	202,205	59.3	425,998	301,276	70.7
Technician								
National	5	Rooms	243	157	64.6	273	316	115.8
		Area	33,997	31,189	92.0	51,539	41,954	81.4
Private	21	Rooms	1,034	883	85.4	1,201	1,057	88.0
		Area	144,078	118,466	82.2	154,782	141,338	91.3
Subtotal	26	Rooms	1,277	1,040	81.4	1,474	1,373	93.1
		Area	178,075	149,655	84.0	206,321	183,292	88.8

Source: Material from Project Institutions.

5.18 Availability of Laboratory and Workshop Equipment (Table 5.12). The ratio of availability of laboratory and workshop equipment in national colleges of engineering to requirements by MOE increased from 20.8% in 1980 to 64.7% in 1984. In private colleges of engineering, the ratio increased from 31.4% in 1980 to 67.5% in 1984. In all the colleges of engineering, national and private, the ratio increased from 27% in 1980 to 66.5% in 1984.

5.19 The ratio of availability of laboratory and practice equipment at national and public junior technical colleges, improved from 18% in 1980 to 98% in 1984, and of private junior technical colleges from 34.4% in 1980 to 73.5% in 1984. For all the junior technical colleges, national, public and private, the ratio was raised from 29.4% in 1980 to 81.7% in 1984.

5.20 In 1980, the goal to be achieved by the project institutions in acquiring laboratory and workshop equipment under the project was set at 70%. The ratio at junior technical colleges reached 81.7%, but that at colleges of engineering reached 66.5%. The cause of the shortage at engineering colleges was that the admission of engineering students suddenly increased by 30% in 1981 from 1980 and demand for education facilities subsequently increased. The higher enrollment was due to the change from the student admission quota system to a graduate quota system in 1981.[11/] The sector program was prepared on the basis of the student admission quota system established in 1978.

Table 5.12: STATUS OF LABORATORY AND WORKSHOP EQUIPMENT

Year	Field/ Type of Institution	Requirement (W million)	Availability Amount	Availability Ratio (%)
1980	Engineering			
	National	51,779	10,793	20.8
	Private	73,421	23,038	31.4
	Subtotal	125,200	33,821	27.0
	Technician			
	National	13,245	2,389	18.0
	Private	30,072	10,358	34.4
	Subtotal	43,317	12,747	29.4
1984	Engineering			
	National	47,008	30,435	64.7
	Private	88,262	59,557	67.5
	Subtotal	135,270	89,992	66.5
	Technician			
	National	18,424	18,034	97.9
	Private	36,130	26,541	73.5
	Subtotal	54,554	44,575	81.7

11/ See Part II on Bank's Observations, para. 5.

Operation of a Mobile Equipment Maintenance Center

5.21 The number of unusable items of laboratory equipment imported under the 1st to the 5th IBRD education loans has increased. In January 1983, the Ministry established the Mobile Equipment Maintenance Center attached to the Gyeonggi Open University to:

(a) Provide technical services and information on equipment repairs;

(b) Ensure regular inspection and maintenance of laboratory and workshop equipment; and

(c) Develop parts which cannot be produced in the country.

The Ministry purchased 209 units of 48 kinds of equipment with $130,000 from the loan proceeds for the establishment of this center. The number of institutions which benefited from this repair center reached 148 industrial high schools, and 86 institutions of technical and college education, totaling up to 234 institutions as shown in Table 5.13.

Table 5.13: INSTITUTIONS VISITED BY THE MOBILE EQUIPMENT MAINTENANCE CENTER

	Industrial high schools	Colleges	Total
Seoul	18	19	37
Busan	11	8	19
Taegu	6	7	13
Inchon	6	4	10
Kyunggi	14	6	20
Kangwon	11	4	15
Chungbuk	10	4	14
Chungnam	16	8	24
Jonbuk	9	5	14
Jonnam	12	8	20
Kyungbuk	16	3	19
Kyungnam	15	8	23
Jaeju	4	2	6
Total	148	86	234

5.22 The quantity of equipment repaired by the Center from June 1, 1983 until December 31, 1984 is shown in Table 5.14.

Table 5.14: REPAIRS MADE BY THE MOBILE EQUIPMENT MAINTENANCE CENTER (June 1, 1983 - December 31, 1984)

Field	Repair requested (Quantity)	Repaired (Quantity)	Technical assistance (Quantity)
Machinery	1,284	257	727
Electricity & electronics	1,547	446	558
Applied chemistry	2,148	1,966	4
Others	33		
Total	5,012	2,669	1,298

5.23 The Mobile Equipment Maintenance Center faces the following difficulties:

(a) shortage of repair specialists;

(b) insufficient knowledge of operation;

(c) no job security for repair specialists; and

(d) shortage of funds for repair.

To solve these problems, the Center has proposed to increase the number of repair specialists from the current 5 to 44 persons, and to upgrade their quality through training. The fields requiring additional recruitment of professional repair experts are measuring equipment, material tests, shaping and cutting, heat handling equipment, repair of fitting apparatus, computing machinery, communication equipment, electronics and electrical equipment, chemical analysis equipment, optical equipment and surveying equipment. About one to six repair specialists are needed for each field.

Training System of Higher Technical Manpower

5.24 For development and adaptation of new technology, a new dimension of engineering is required in the research, design, and production procedures. The ratio of technologists in the industrial workforce is expected to increase from 2.9% in 1978 to about 5% in 1991. The sector program has laid the foundation for a new system to train higher technical manpower. National universities now have quality programs in the fields of electrical engineering, mechanical engineering, chemical engineering, and architectural and civil engineering. The junior technical colleges curricula and syllabi have been changed to produce better intermediate technicians.

Improvement of Graduate Education and Research

5.25 Laboratory equipment imported under the loan has contributed much to graduate education and professors' research activities. A number of research publications have been issued in the engineering field since the start of the sector program, and papers have been discussed at international academic meetings. This phenomenon is evidence of the improved research among professors.

Strengthening Education-Industry Cooperation

5.26 Engineering students are to receive practical training in industries for certain periods of time according to the Law of Industrial Education Promotion passed recently. The purpose is to facilitate students' adaptation to employment. Cooperation in research and development between colleges and industry has also increased through the improved research capability of universities.

6. CONCLUSION AND RECOMMENDATION

Conclusion

6.01 One of the main purposes of the program was to upgrade the quality of the teaching staff. Some 472 professors of engineering education underwent overseas training, and 106 overseas Korean scholars were repatriated. In management education, 139 professors were trained overseas and 82 students were sent overseas for future professorships. At junior technical colleges, 448 professors were sent overseas for training. This volume of overseas training reached the original plan of the sector program.

6.02 The ratio of professors with postgraduate degrees increased on a large scale. In colleges of engineering in 1980, the ratios were 39.4% and 50.6% for doctor's and master's degrees respectively. These ratios improved in 1985 to 53.9% and 42.7% for doctor's and master's degrees respectively. In the case of junior technical colleges, the ratios of 0.3% and 54.2% for doctor's and master's in 1980 improved to 2.6% and 86% in 1985 respectively.

6.03 Regarding recruitment of teaching staff, the student:teacher ratios in 1985 compared with those in 1980 did not advance as originally projected. The main cause was the change in the student quota system, which was changed to the graduate quota system from the admission quota system during the project period, resulting in a 30% increase in new admissions.

6.04 The availability ratio of laboratory and workshop equipment increased greatly through the sector program. For engineering education, it increased from 27.0% of requirements in 1980 to 66.5% in 1985, and for technician education, it increased from 29.4% in 1980 to 81.7% in 1985.

6.05 The covenants under the Agreement were accomplished. They included processing of subprojects, improving the Committee for Manpower Development and Promotion, preparing proposals for a flexible student allocation system for higher technical education, establishing a technician education research center, reducing student:teacher ratios, reporting audits on accounting of project costs, and support to private institutions.

Recommendations

6.06 About 85% of the loan proceeds was disbursed for the purchase of laboratory equipment and 15% was for training of teaching staff and development of curricula. While good quality equipment has been imported, little effect is expected without training of teaching staff. Prior to procuring equipment, teaching staff should be recruited and trained.

6.07 To achieve maximum use of high-priced items of equipment imported under education loans, they should be pooled by institutions for common use among departments. Operation and repair experts should be allocated and the budget for operation should be increased.

6.08 Measures should be taken to maintain equipment to avoid breakdowns and shortage of spare parts. Since the Mobile Equipment Repair Center exists already, these problems may be resolved through a large-scale improvement of the Center.

6.09 Korea has increased its higher education enrollment to the same level as advanced countries. There have been, however, constraints to the growth of education, in quality as well as in quantity, due to shortages of teaching staff, rapid enrollment increase, and poor conditions of education facilities. The sudden quantitative growth of higher education may have been in response to the growing social demand for higher education, but it failed to meet the demand for quality manpower and might lead to social and individual waste of resources. The long-term purpose of higher education should be, therefore, aimed at improving the quality of education in order to supply the required high quality manpower.

6.10 Korea has entered into the world society of industrial advancement in the 2000s. Demand for research manpower in the fields of science and technology will increase from 32,000 in 1983 (8 to 10,000 population) to 150,000 in 2001 (30 to 10,000 population), the level of the advanced countries. For development of science and technology manpower, the following points should be stressed:

(a) To widen the base of science and technology, substantial improvements in basic science and technology curricula should be made beginning with elementary and secondary education.

(b) The quality of engineering education at the undergraduate level should be upgraded through training of teaching staff and expansion of support for modern laboratory equipment.

(c) The production of higher technology manpower should increase to support the development of advanced technology such as electronics, computer systems and genetic engineering.

(d) Graduate education should be promoted. Research professorships should be expanded for strengthening R and D capability at graduate schools, and investments to support research institutes attached to universities should increase.

6.11 MOE has been implementing the 2nd Bank-financed sector loan project (Loan No. 2427-KO) since 1984 as part of its effort to upgrade the quality of science and technology education. The Project is expected to contribute to the improvement of science and technology education through carrying out the experimental secondary education programs, upgrading the quality of teaching staff at colleges of natural sciences and colleges of engineering, and providing laboratory equipment.

6.12 For a leading role in research and development, and education in the fields of science and technology: (a) high caliber manpower must be trained to generate innovations in science and technology; (b) the supply of laboratory equipment for higher education institutions should be expanded through continued investments; and (c) efforts should be directed toward upgrading the quality of teaching staff and their recruitment.

6.13 Investments should be increased for promotion of education at graduate schools and research programs in the advanced science areas which have so far been comparatively neglected.

PART II - BANK OBSERVATIONS

KOREA

SECTOR PROGRAM ON HIGHER TECHNICAL EDUCATION (LOAN 1800-KO)

PROJECT COMPLETION REPORT

1. The Bank's first education sector loan can be distinguished from traditional project loans by the impact it has achieved on the entire sector. While previous Bank financed projects in Korea show benefits to individual project institutions, the sector loan show wider-sweeping effects. The accreditation system established has extended beyond the technical fields supported by this sector program. The Korean Council of University Education (KCUE) established in 1984 has now taken over the accreditation function and will conduct evaluation on all university departments. Another evidence of sector-wide impact is the junior technical college system. The colleges were founded around 1979 to train technicians for industry. At the time, industry was only beginning to recognize the role of the technician as an important link between the engineer and worker. The colleges had teaching programs adapted from universities with no clear definition of the skill requirements of technicians. The project has given clearer definition to the content and role of this subsector.

2. The sector loan is able to achieve broad results because it addresses policy issues that affect the entire sector. This section would give the Bank's view of the extent to which policy objectives were attained, the implementation of subprojects and the institutional framework, and draw from them the lessons learned.

Policy Objectives and Outcome

3. Flexibility. A central aim of the program is to introduce more flexibility into the planning and management of higher technical education in order to allow the system to respond more quickly to changes in labor market demand. Means to achieve this included: establishing a permanent capacity for manpower analysis, replacing the centrally controlled quota system with one that enhances transfers between departments, deferring early specialization in favor of broad general training, and introducing in-service and retraining programs.

4. A major achievement under this objective was the creation of a permanent manpower planning agency under the Economic Planning Board. The Manpower Development Committee is a coordinating body for monitoring manpower supply and demand information. It consists of the relevant agencies such as the Ministries of Labor, Science and Technology and Education and several research institutes such as the Korean Development Institute. The committee is responsible for overall coordination of manpower development plans and projection of manpower demand and supply and employment policies. The Ministry of Education determines college admission quotas in consultation with this manpower planning body. The EPB has also established since 1984 a Manpower Coordinating Division as staff for manpower development planning and analysis.

5. With respect to the introduction of greater flexibility to higher education management, the results were mixed. In July 1980, the Government established a set of education reforms in reaction to the political crisis and economic downturn of that period. To absorb some of the unemployed high school graduates, the Government expanded admission by introducing the graduate quota system in the 1981/82 school year. Instead of determining the number of admissions for a certain year, the graduate quota system dictates the number of output. To allow for dropout, universities had to admit more than the quota. MOE set the dropout rate at 30% for universities and 15% for junior technical colleges. The result was that universities had to admit 130% of the quota and the junior technical colleges, 115%. The sudden increase in enrollment had several adverse effects including: (a) an aggravation of shortages of facilities and other resources; (b) a forced dropout rate of 30% in universities and 15% in junior technical colleges which are about double the natural dropout rate; (c) increased barriers to transfers between departments. However, central control of student admissions has since been relaxed and universities now have more autonomy in allocating admissions by college and department.

6. Besides satisfying social demand for higher education, the graduate quota system also served the purposes of normalizing secondary education and spurring university students to work harder. In the late 1970s, the mode of teaching and learning in secondary schools was influenced by acute competition for univer ty admission. In order to attain a high score at the national entrance examination, students concentrated on a few subjects and learning by rote was common. The Government regarded this as unhealthy and was concerned with the inequality of opportunity for higher education. Employment of private tutors was rampant but such practice benefitted only those who could afford it. Therefore, the Government expanded admission through the graduate quota system. The high failure rate dictated by the system was also part of the Government's strategy to make university students work harder.

7. The side effects of this policy, however, have forced the Government to modify it. Universities are now allowed to reduce admission between 110-130% of the quota. Enrollment in colleges of engineering peaked at about 136,000 in 1982 and declined by 6% to about 127,000 in 1983 and further to 126,000 in 1985. The Government has declared a freeze on university enrollment in the future. The balance between science and engineering and the humanities and social sciences, however, will change. Currently, the ratio of science and engineering students to those in the humanities and social sciences is 40% to 60%. The goal is to reverse this ratio by 1991, which means science and engineering enrollment would increase while that in other fields would decline.

8. A remedy for the adverse results of the graduate quota system was the conversion of six junior technical colleges into open universities. These universities provided opportunities of continuing education for students forced to drop out because of the graduate quota system and for graduates of junior colleges. They also became a place for retraining of industrial workers. Admission to these universities is based on the applicant's school and work records and not on the national entrance examination score. The universities also have greater flexibility in determining admissions and transfers between departments. Their establishment was a step in the direction of the policy objective of the loan.

9. Quality Improvement. The emphasis of the program was to improve the quality of higher technical training by establishing accreditation agencies, adapting teaching programs to industrial requirements, increasing the supply and improving qualifications of teachers and providing more laboratory equipment.

10. The accreditation system that evolved out of the sector program succeeded in evaluating programs against established training standards, but the enforcement of these standards was not as successful. Firstly, institutions have few incentives to accept accreditation. After evaluating a college, an accreditation agency sends the report to the institution, pointing out strengths and weaknesses and giving recommendations for improvements. The results cannot be publicly announced because of social and political sensitivities. In the case of junior technical colleges, the evaluation results are used to determine annual budget allocations. Thus these colleges have more incentive to comply with recommendations of the accreditation agency. In the case of universities, however, evaluation results are reflected only in allocation of research funds for professors. Universities had no strong incentive to comply. Compliance has been based more on desire on the part of the management to maintain the prestige of an institution. A second obstacle was the lack of funds and manpower to carry out a thorough study of the characteristics of an institution.

11. Despite the above problems, the evaluation carried out by the accreditation boards provided a stimulus for improvement among the colleges. Following completion of the sector program, the accreditation functions of the boards have taken over by the KCUE for universities and the Nonformal and Vocational Education Bureau for junior technical colleges. The KCUE is an association of 111 colleges and universities to promote autonomy and public accountability in university management and to develop higher education. Its functions include conducting evaluation of universities, workshops and seminars on curriculum and teacher education, and studies on university management, and providing advice and recommendations to the Government on higher education issues.

12. Overall, the program's qualitative impact is most apparent in the development of junior technical colleges, particularly in curricula. The Technical Education Research Institute has developed a number of teaching modules and provided seminars for more than 3,000 teachers on new teaching materials and methodology on how to develop modules. Cooperative programs with industries have been established and colleges are required by law to provide one to three months of on-the-job training for students.

13. Quality improvement in colleges of engineering was achieved mainly by the increased availability of laboratory equipment, enabling students to conduct experiments which were not possible before. However, the amount of time spent on laboratory work varies among colleges and the MOE does not impose a minimum. The only MOE guideline on teaching programs is that 30% of the credits should be in general courses outside the engineering fields. In the colleges visited by the Bank's completion mission, the credit requirements for basic science and engineering have increased to about 40% in accordance with appraisal targets. The curriculum models developed by Korean Engineering Education Board have been disseminated to the colleges, but there is no follow up on their adoption. The supply of staff increased by 115% and improvements

in staff qualifications exceeded appraisal target. However, the rapid increase in student enrollment has reduced the impact of these achievements and the student-teacher ratio remains high (Part I, para. 5.2). The ratio in colleges of engineering for instance is currently 36:1, compared with the appraisal target of 21:1. The date for achieving the target ratio has been adjusted to December 1990. The second Education Sector Loan (Ln. 2427-KO) contains an action program for achieving this ratio, with interim targets for mid-term review in 1987.

14. In business management, the overseas training of new teachers and local in-service training are the major accomplishments. About 15 PhD graduates out of 90 fellows have returned and have been instrumental in introducing new courses and revising curricula. The full impact of this component would not be apparent until the return of all the other participants within the next few years. However, as with engineering, efforts to improve the quality of education in this field were impeded by a doubling of enrollment in 1981.

15. Investment in Private Education. A third objective of the sector program was to lessen the investment gap in private higher technical education by channelling sector loan as well as additional government funds into private institutions and studying the feasibility of raising student fees.

16. This objective has been met: about 58% of the loan for subprojects were channelled into private institutions, in addition to other government financial assistance in the form of subsidies, commercial loans arranged by the MOE and assistance in interest payment (Part I, para. 3.26). The Government regulates student fees by imposing a ceiling on the annual increase in order to maintain the increase no higher than the overall rise in the cost of living. Government policy in the sixth five-year plan (1987-91) is to continue this practice. To assist private institutions in raising revenues during the next five years, it plans to establish a foundation for private institutions consisting of government contributions, commercial loans and donations amounting to Won 150,000 million. The Government passed a law recently, granting tax exemption on contributions to private education.

Implementation of Sector Program

17. Institution-Building. One of the purposes of a sector loan is to build up the borrower's capacity to develop and appraise projects. Although disbursements had a slow start because of the novelty of the procedures, the pace of implementation picked up rapidly during the second year of the project. The procedures for the processing of subprojects -- from preparation by the institutions to appraisal by the MOE and final approval -- have been successful. The same mechanism is being used under the second sector loan and has been a reference for sector loans in other countries.

18. Criteria and Guidelines for Loan Allocation. MOE selected the subprojects according to the criteria and guidelines agreed with the Bank. They were found to be useful and valid.

19. Equipment Procurement. Following approval of a subproject by MOE, each university contacted OSROK directly for procurement. According to EFB, equipment items could not be grouped for bulk procurement because the timing

of the subprojects was different and each institution wrote its own specifications. As a result, many small contracts were signed, giving rise to a formidable amount of paperwork. The Bank's loan department had to process more than 3,000 payments, some of which were less than US$100. In the second sector loan, the establishment of the special account has resolved this problem for the Bank. However, the burden of disbursement against numerous contracts now falls on the implementing agencies.

20. Fellowship Program. Administration of the fellowship program was separate from that of the subprojects which focussed on hardware. The engineering board, for example, was responsible for implementing the fellowships program for engineering colleges. It took into consideration the plan for faculty development included in each subproject application and allocated 100 fellowship slots a year in proportion to the number of professors in each institution. Two problems arose from such allocation. Firstly, the distribution was not based on the needs of the college but on the status quo. This gave rise to the criticism that the national universities received more slots because most of them had larger teaching staff. Secondly, the provision of equipment and staff training were not carried out as parts of a coordinated program. For instance, staff requirements for operating and maintaining equipment were neglected, causing problems described in Part I, para. 3.29.

Bank Performance

21. The approach to project supervision adopted by the Bank differed from that for a standard project loan. According to procedures specified in the staff appraisal report, subproject processing only required Bank prior approval for subprojects in excess of US$2.5 million. Other subprojects as well as procurement procedures were reviewed by Bank staff on the basis of random ex post review. Supervision focussed to a greater extent on policy and institutional changes as measured by project indicators that were agreed with the implementation unit on the occasion of the first supervision mission. Morover, formal discussion of policy and institutional changes was held once a year as part of a joint annual review. Government prepared detailed reports in advance of their annual review that served as the basis for discussions. A major point of difference with Government from the outset of project implementation was the rapid increase in enrollments that occured with the shift to a graduate quota system. Views of both sides only converged when enrollment growth was reined in during the final three years of project implementation and when it was agreed that the targets for student teacher ratios should be adjusted to coincide with the framework and time horizon of the Second Sector Loan approved on May 1984. For the Bank this broader focus of project supervision provided opportunity for dialogue on a sector-wide basis even if points of view of Government and Bank staff did not always coincide.

Lessons Learned

22. Student-teacher Ratio. The loan agreement contained a covenant on the target student-teacher ratios. When the Government failed to meet these ratios by the stipulated dates, the agreement was amended to reflect the new deadlines for meeting those targets that corresponded with the agreed framework for the Second Sector Loan. This ratio, however, should not have been singled out as the sole indicator on project outcome. The role of part-time teachers employed from industries, class size or contact hours between teach-

ers and students, qualifications of teaching staff, research budgets are other dimensions of quality that are not captured in a single ratio. Placing it in the loan agreement has also given it too much prominence and not enough attention to other indicators of equal importance. The second sector loan has taken this lesson into account. The target student-teacher ratio was mentioned in the SAR and the Government's policy letter but was not made a loan covenant. The second loan also contains a number of other project outcome indicators which would provide a multi-faceted evaluation of the program's impact. They include the number of full-time staff, recruitment and attrition, the number of part-time staff and their full-time equivalent, average number of experiments performed, and whether advice of accreditation agencies has been provided to and taken into account by colleges.

23. Project Processing Time. The elapsed time between appraisal and board presentation was 485 days compared with a regional average of 319 days. This was necessary because a sector program required a thorough review of the issues and policy alternatives that would affect the entire sector. The nature of sector work, preparation and appraisal is also different from a traditional project. For preparation of the sector program, the Government organized four study teams to identify the Government's policy directions and to make comprehensive analyses and proposals in the fields of manpower supply and demand, engineering education, management education and technician training. Appraisal was carried out in two stages, about six months apart, focussing on broad policy issues and the overall project framework. Appraisal was complicated because the sector review and subsequent work had not provided sufficient analysis on a number of vital aspects such as the Government's policies on enrollment expansion. Although a sector program inherently requires more time to prepare, the process could have been shortened if the kind of policy analysis needed was foreseen from the start of sector work.

24. Accreditation. The accreditation system has succeeded in setting standards but it does not have the mechanism to enforce them or provide incentives to institutions to reach those standards. MOE should explore means to improve the system under the second sector loan which finances accreditation for science and technical fields. The evaluation results, for instance, can be used in the allocation of budget or subsidies to institutions.

25. Implementation Procedures. Although MOE took precautions to prevent delays, such as testing out implementation procedures on five subprojects before negotiations, the program still experienced delays during the first year. In the second loan, the procedured were improved to accelerate implementation, including appointment of technical review committees and processing of subprojects well in advance of the effective date of the loan. Some delays have still occurred. This highlights the importance of bringing the Government's subproject appraisal further upstream in the project cycle, particularly the preparation for equipment procurement.

26. Equipment Maintenance. The Government has organized a unique system for laboratory equipment maintenance which would be useful experience for other countries. This system contains three elements: (a) minor repairs would be carried out by the colleges themselves; (b) repairs on precision equipment would be done by a research laboratory under the Ministry of Science and Technology; and (c) major repairs on other equipment would be done by the Mobile Equipment Maintenance Center attached to Gyeonggi University (see

Part I, para. 5.21). The center is funded by MOE, which plans to establish it as a permanent organization and expand its capacity within the next few years.