OF/DE

27778

National Library
of CanadaBibliothèque nationale
du CanadaCANADIAN THESES
ON MICROFICHETHÈSES CANADIENNES
SUR MICROFICHE

NAME OF AUTHOR/NOM DE L'AUTEUR

JOHN RITCHIE 1926-

TITLE OF THESIS/TITRE DE LA THÈSE

HUMAN RESOURCES : KEY TO
INDIGENOUS INDUSTRIALIZATION
AND NATIONAL TECHNOLOGICAL CAPABILITY IN PERU

UNIVERSITY/UNIVERSITÉ

CARLETON UNIVERSITY

DEGREE FOR WHICH THESIS WAS PRESENTED/

GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE

MASTER OF ARTS

YEAR THIS DEGREE CONFERRED/ANNÉE D'OBTENTION DE CE GRADE

1976

NAME OF SUPERVISOR/NOM DU DIRECTEUR DE THÈSE

DR. D. R. F. TAYLOR

Permission is hereby granted to the NATIONAL LIBRARY OF
CANADA to microfilm this thesis and to lend or sell copies
of the film.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈ-
QUE NATIONALE DU CANADA de microfilmer cette thèse et
de prêter ou de vendre des exemplaires du film.

The author reserves other publication rights, and neither the
thesis nor extensive extracts from it may be printed or other-
wise reproduced without the author's written permission.

L'auteur se réserve les autres droits de publication; ni la
thèse ni de longs extraits de celle-ci ne doivent être imprimés
ou autrement reproduits sans l'autorisation écrite de l'auteur.

DATED/DATE

Oct 25/76

SIGNED/SIGNÉ

PERMANENT ADDRESS/RÉSIDENCE FIXE

204 Driveway, #204
Ottawa Ontario

HUMAN RESOURCES: KEY TO INDIGENOUS INDUSTRIALIZATION
AND NATIONAL TECHNOLOGICAL CAPABILITY IN PERU.

By John Ritchie

A thesis submitted to Carleton University in partial
fulfillment of the requirements for the degree of
Master of Arts in International Affairs.

School of International Affairs
Carleton University
Ottawa, Canada

April, 1976.

The undersigned hereby recommend to the Faculty of Graduate Studies and Research acceptance of this thesis, submitted by Jack Ritchie, in partial fulfilment of the requirements for the degree of Master of Arts.

Michael G. Fry, Acting Director,
Norman Paterson School of International Affairs

D.R.F. Taylor, Supervisor

ACKNOWLEDGEMENTS

The opportunity to undertake the field research for this paper was afforded me through a Research Associate Award from the International Development Research Centre. I am extremely grateful to IDRC and the staff of the Division of Social Sciences and Human Resources for their recognition of the need of those interested in the field of development to obtain first hand experience to increase their knowledge and understanding of the realities in developing countries.

In connection with my field research I would like to acknowledge the support of Dr. Antonio Manzur Barrios, Director General de Educación Superior and all those in the Dirección General de Educación Superior and other departments of the Ministry of Education who were so helpful. Without their assistance, and that of individuals in the many educational institutions, ministries, state and private industries, national and international research institutions, I could never have learned so much in so little time.

I would like to mention specifically the cooperation I received from the Escuela Nacional de Ingeniería Técnica with which I was officially associated. The administration and faculty could not have been more helpful.

Finally, I would like to acknowledge the assistance of the Norman Paterson School of International Affairs, the administration, the faculty and especially Professor D.R.F. Taylor for his encouragement, guidance and supervision which motivated me to expand my horizons. Thanks also to Professor R. Morrison for his special expertise and advice.

ABSTRACT

The aim of this paper is to illustrate the importance of highly qualified and skilled human resources for indigenous industrialization at two levels. The first is the productive level, the second is for research and development with emphasis on the acquisition and application of industrial technology.

The first part of the paper describes the Peruvian model of industrialization within the new national priorities. The structural reforms and instruments for their implementation are discussed.

The following chapters deal with the Educational Reform in Peru and compare the status of traditional education in Peru with that in the rest of Latin America.

The middle chapters concentrate on specific areas of importance to the success of the Educational Reform and adequate preparation of human resources; the improvement of (i) science teaching, (ii) equipment and teaching materials for professional education, and (iii) the quality of teaching.

The latter chapter examines and compares the methods and institutions to be utilized to develop a national research and technological capability in a developing country such as Peru.

The final chapter sets out the paper's conclusions.

TABLE OF CONTENTS

	PAGE
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
TABLE OF ANNEXES	iv
INTRODUCTION	1
CHAPTER I The Peruvian Model of Development: Its Structure and Implications.	5 ^u
CHAPTER II Demands on Education.	23
CHAPTER III Peru's Science and Technology Policy: Implications for Education and Training	38
CHAPTER IV Educational Reform: Origins and Goals	50
CHAPTER V Status of Education in Peru Within the Latin American Context	62
CHAPTER VI Science Teaching	74
CHAPTER VII Equipment, Materials and Maintenance	87
CHAPTER VIII The Teaching Profession	102
CHAPTER IX Basic Research and Technological Development for Industry	126
CHAPTER X Conclusions	140
ANNEXES	143
BIBLIOGRAPHY	160

TABLE OF ANNEXES

ANNEX	PAGE
I A Survey of Foreign Specialists Working in Peru	143
II Educational Structure: (1) Existing (2) Reformed.	145
IIa Calendario de la Aplicación de la Reforma de la Educación. (Calendar of Conversion to Reformed Educational System) Educación Basica Regular-Regular Basic Education.	146
IIb Calendar of Conversion to Reformed Education System First Cycle of Higher Education	147
III Interviews with Recent Graduates: Institutions and Disciplines.	148
IV Effect of Education on Employment and Incomes in Peru.	151
V Teachers Salaries (Range and % of M.O.E. Budget)	152
VI University Professors Salary Range	153
VII Salary Levels of Professional and Technical Personnel in Industry.	154
VIII Peru-Balance of Trade, 1970-1975:	155
IX Increase in Personnel for the Expansion of SIDERPERU- 1975-1981.	156
X Requirements for Professionals with Post-Graduate Training Industry and Tourism Sector.	157
XI National R & D Expenditures by Sector and country 1967.	158
XII Industrial Sector: Public Investment in Pre-Investment and Works and Equipment 1975-1978.	159

INTRODUCTION

"The riches of a country reside in the intelligence and preparation of its men; no century like the present has revealed with such clarity the paramount mission of intelligence, the indisputable supremacy of the spirit. The distance, which increases daily between the industrially advanced countries and the countries of the Third World, is not encountered fundamentally in material resources, but in human resources, which are a function of the education that we give young students." The foregoing quotation from Mario Samané Boggio, ex-president of the National Council of Peruvian Universities, present president of the National Research Council, represents the view of a distinguished Peruvian of the importance of human resources to a country's development.

The central hypothesis of this paper is that given the political will to pursue a relatively autonomous economic development model such as Peru is in the process of implementing properly qualified human resources are a nation's greatest asset. If a country wishes to industrialize while maintaining social priorities and economic sovereignty then it is imperative to set about providing the proper numbers and mix of highly qualified and skilled human resources required by a self-reliant model of development.

The Revolutionary Government of the Armed Forces (RGAF) possesses the political will and social control to implement their development plan. This plan puts heavy emphasis on indigenous industrialization and technological independence. They have managed to find the financing (\$3.5 billion approved by the Consultative Group of the World Bank, April 16-17, 1975) for a substantial number of development projects, among them many in the industrial sector. Lacking the technological infrastructure, most of these projects will be implemented utilizing foreign technology and

know-how, at least in the short run. (see chapter III) Peru has the natural resources necessary to an industrialization program.

The final ingredient vital to an indigenous industrialization program is manpower, most particularly highly qualified manpower needed to plan, execute, manage and operate an industrialization program. This is even more critical if it is the intention to develop, or at least adapt, technology specific to the development needs of Peru.

Further, the task is not only to provide the highly qualified human resources (HQHR) and skilled labour for expansion of the economy, but also to improve the quality of existing manpower to increase productivity, and permit the Peruvianization of HQHR in existing industry.¹

This paper will examine the historical experience of Peruvian industrialization and the present strategy of the Revolutionary Government of the Armed Forces (RGAF) to improve the supply and quality of indigenous scientists, engineers and technologists required to staff the national planning, research and productive organizations designed to achieve a truly Peruvian model of economic growth.

Because the educational system, conceived in its broadest sense to include non-formal institutions and mechanisms, will be called upon to play an important role in the preparation of human resources for economic development and indigenous industrialization, this paper will be comparing past, present and future relevance of the system for these purposes. I will give special attention to the capacity of the educational system, to prepare HQHR for the acquisition, adaptation and commercialization of industrial technology from foreign sources, and to develop a national capacity to innovate domestic technology to reduce dependency on foreign

sources.

Chapter I deals with the Revolutionary Government of the Armed Forces' development plan and the political, social and economic motivations behind its formulation. It will look at the reaction to historical foreign domination of the Peruvian economy, the present technological dependence, and Peru's internal socio-economic dualism. It will also describe some of the more important structural reforms in industry and agriculture designed to rectify past inequities and the importance of highly qualified human resources (HQHR) and an educated people to this model of development. Chapter II discusses the need to industrialize indigenously to reduce the negative balance of payments situation partially due to the high percentage of imported inputs utilized in the industrial sector. The Peruvian model of industrialization conceived by the Revolutionary Government of the Armed Forces (RGAF) calls for a dominant entrepreneurial role by state enterprises and substantial participation of workers in the management of new forms of enterprise. These innovations plus the expansion of industry within the framework of the Andean Common Market create an implicit demand for better educated and better qualified managers, professionals, technicians and more skilled labour. The trends and problems involved are discussed in this chapter.

Chapter III concerns itself with Peru's Science and Technology policy within the indigenous industrialization effort. The new methodology for acquisition of foreign technology, the commitment of the RGAF to relative technological independence, and the institutions created to effect this goal are all discussed. INDUPERU's role and the implications for HQHR are assessed as well.

Chapter IV looks at the philosophical roots of the revolution, and the role of the Educational Reform in the structural transformation of Peruvian society. It also considers the weaknesses of the traditional education system and the need to develop new values to achieve the twin goals of indigenous industrialization and development of national technology. Chapter V deals with the status of education in Peru comparing it to the rest of Latin America. The explosive growth in demand at the middle level and university is examined. The key role of the ESEP is discussed in relation to the needs for middle level management in a society where the rewards are inadequate for technicians and disproportionately favourable to the university graduate.

Chapter VI concerns the weakness of science teaching in the traditional education system and the strong effort being mounted to rectify this problem through the PRONAMEC science teaching improvement program organized by INIDE/UNICEF/UNESCO. This is one of the most encouraging responses the Reform has generated.

Chapter VII documents the serious lack of equipment for science teaching, vocational and professional teaching at all levels from secondary to university. Some suggestions are recorded for improving the situation within the economic limitations.

Chapter VIII deals extensively with the teachers who are the most important element in the Educational Reform. Their economic, social and political problems are discussed as well as the requirements to upgrade their qualifications to meet the new demands of education more suited to the economic development of Peru.

Chapter IX weighs the capacity of the university to engage in mission-oriented research for industry. It looks at the Canadian and Peruvian experience in this area in an attempt to come to some conclusion as to the possibilities.

Chapter X sets out the conclusions of the paper. Most of the material for this paper was obtained during a three month field trip to Peru which I undertook during the last part of 1975 in an effort to obtain the most up to date and reliable information possible. Much of the evaluation of the educational system is based on the responses obtained in personal interviews with recent graduates of the system who were employed in the manufacturing industry. It is my hope that the paper's conclusions will be useful to those concerned with improving the relevance of an educational system for socio-economic development, in Peru or elsewhere.

CHAPTER I

THE PERUVIAN MODEL OF DEVELOPMENT: ITS STRUCTURE AND IMPLICATIONS

Why choose the preparation and training of highly qualified human resources (HQHR) and skilled labour as the critical factor for Peruvian economic development? And why specifically for industrialization? Let me hasten to explain that although I shall be touching only lightly on the subject of the Agrarian Reform and the role of the Educational Reform to contribute to its success, I am a firm believer in the importance of agriculture to any integrated development plan.. This is especially true for Peru for several reasons. Firstly, it is necessary to reduce or eliminate if possible the large outflow of scarce foreign exchange presently being spent to import food ² by increasing and diversifying agricultural production. Secondly, it will be necessary to improve the employment opportunities in the rural areas and provide more and better services to staunch the flow of rural immigrants attracted to the urban centres by the apparent employment opportunities and better social amenities. Thirdly it is important to bring the marginalized subsistence sector into the money economy to expand the internal market to make industrialization more viable, even within the expanded framework of the Andean Common Market.

However, if the Agrarian Reform is successful in the long run, the available land,³ using present labour-intensive technology, cannot usefully employ all the working age population living in the Sierra. It was estimated in 1965 that there was an excess of 900,000 agricultural workers in the Sierra, and that even if the Agrarian Reform had been implemented there still would have remained 440,000

sub-employed or unemployed.⁴ The problem has increased substantially since, given the 3.1% rate of population increase in the interim⁵ and the slowness of the implementation of the land reform program.⁶

Therefore Peru faces an employment creation problem of major proportions. Irrigation of arid zone lands and colonization of the upper jungle areas offer some possibility of increasing the arable land and agricultural employment but these are costly solutions. The government in a search for solutions has planned a dualistic approach to employment creation. Manufacturing (modern, large scale), mining, fishing, public utilities, commerce, business and financial services will be expected to produce an economic surplus which can either be reinvested within the sector to produce additional growth or can help to finance investment in labour intensive sectors agriculture, construction, manufacturing (artisan) and personal services.⁷

Assuming then that industrialization is necessary to an integrated development plan, it is necessary to develop an industrialization strategy in keeping with the socio-political priorities of the country. Peru's Revolutionary Government of the Armed Forces has chosen a particular strategy that relies heavily on indigenous highly qualified manpower. Let us now consider this strategy and its rationale.

The Peruvian Revolution entered its second stage with the bloodless coup that saw General Velasco Alvarado replaced by General Morales Bermúdez August 29, 1975. President Morales Bermúdez stated that there would be no fundamental changes in the philosophy or the objectives of Plan Inca, the R.G.A.F.'s development plan. He did say,

however, that "there would be a critical evaluation of the progress of the Revolution towards achievement of its goals. He also referred to pre-revolutionary Peru as "underdeveloped and dependent", a status that was changing internally as a result of a continuous process of socio-economic development synonymous with structural change that was constructing a social democracy of full participation (plena participación), and externally through regional efforts of the Andean Group."⁸

Plan Inca, the master plan for the Peruvian model of development, is in many ways a reaction to the historical underdevelopment and dependence. It is important to keep this in mind because it helps to explain Peruvian development policy, which cannot always be rationalized entirely in economic terms. For example, the industrialization strategy is based on a desire to make industrial development a part of an integral socio-economic development plan which places social goals and national dignity on a par with economic growth and/or profitability. The often mentioned technological independence is not economically feasible and probably will evolve into selective technological self-reliance. Another priority of the Revolution is a more rational distribution of the economic surplus according to 'eminently social criteria'. The most important instrument is to be the Social Property Enterprise, (Empresa de Propiedad Social, E.P.S.) funded by the state and managed by the workers. The Revolutionary Government of the Armed Forces is counting heavily on this form of production unit to generate a true spirit of solidarity (cooperation of labour without the traditional strife)⁹ and is giving it priority over all other types of productive organization.¹⁰

I would like now to develop a little more fully the underlying rationale for the Peruvian and Andean approach to industrialization, which could be viewed as nationalistic and excessively restrictive from the point of view of a traditional North American or Western European investor.¹¹ It is conceivable to argue that the large North American, Japanese or Western European firms have the technology, expertise and financing to organize a new production unit quicker and more efficiently than a national enterprise in a developing country. However, there are serious criticisms of the associated disbenefits of direct foreign investment in industry. These are extensively documented in Eduardo Anaya Franco's recent study of foreign investment in Peru and its negative repercussions.¹²

One of the principal criticisms of foreign direct investment is that the priorities have traditionally been set by the needs of the industrialized home countries of these international corporations, not by the development needs of the host country. In the case of Peru the first stage of foreign investment was oriented to the extraction of raw materials such as minerals and petroleum to supply the needs of industry in the more developed countries. There was little local value added, minimal employment of Peruvians, hardly any transfer of the technologies utilized. There were, admittedly, some side benefits of foreign investment, i.e. the physical infrastructure constructed to facilitate the extraction of ores and oil, railways, roads, ports and capital intensive oil refineries, utilizing a relatively small labour force. These were not necessarily located for regionally - balanced.

development such as is being emphasized today in a planned, decentralized model of economic growth.

A second major criticism of foreign direct investment is the displacement of local enterprises in the manufacturing sector into the least profitable fields such as non-durable consumer goods, foreign capital having concentrated its investment in production of the more profitable capital and intermediate goods. The multinational corporations (MNCs) were able to establish a monopolistic-oligopolistic structure in these industries due to their vastly superior financial power and the introduction of more advanced technology. And because MNCs had the capacity to organize work relations and productive processes in a more productive manner in terms of cost/benefit, the national enterprises, with their bureaucratic and poorly rationalized forms of organization found it increasingly difficult to compete, leading to their eventual marginalization in the most dynamic sectors of the economy.¹³

Thus Peru's industrialization was intimately linked with foreign capital, which changed its emphasis from raw material extraction to the manufacturing sector in the fifties and sixties. North American investment in the Peruvian manufacturing sector increased 593% between 1950-1971 from \$15 million to \$92 million.¹⁴ By 1969, 242 foreign enterprises controlled 43.8% of the production and 40% of the fixed assets of Peru's manufacturing industry, operating approximately 348 industrial establishments.¹⁵ Foreign capital controlled sixteen major industrial categories (controlled 50% or more of the production within the category) and

exerted important influence in sixteen others (controlled between 25% and 50% of the production of the category).¹⁶

The high level of foreign ownership of Peruvian industry was the consequence of, or at least facilitated by, the concessionary Industrial Promotion Law No. 13270 promulgated by the government of Manuel Prado Ugarteche in 1959. Similar treatment of foreign investment in the mining sector had produced a situation of dominance of this sector by four North American companies. This was facilitated by the liberal mining code promulgated by the Odría government guaranteeing reexport of capital and profits, no tax increase for 25 years, depletion allowance, duty-free importation of machines and tools.¹⁷

Thus far Peru had followed the pattern of many lesser developed countries in pursuing exploitation of her raw materials using outside capital and technology, and 'industrialization by invitation', to use Sir Arthur Lewis' expression. What influence did this policy, which led to foreign domination of her mining industry and the most important part of her manufacturing industry, have on Peru's overall development?

Indigenous development was retarded or thwarted in several ways. First, although invested capital deserves some sort of return for its use (unless you hold the Marxian view that interest is usury) Peru has paid dearly for foreign investment within her borders. For a net investment of \$371 million between 1950 and 1971 U.S. corporations and their subsidiaries have generated profits of \$1,283 million in the same period. Although \$104 million was reinvested in Peru \$1,162 million left the country. Add to this the increase in the internal capitalization of U.S. investment from \$145 million to \$674 million, or \$529 million, and

you have a total declared return to net U.S. investment in Peru of \$1,691 million for the period, representing a 4.5 to 1 ratio.¹⁸

The loss of \$791 million abroad contributed to a serious balance of payments problem. I realize that it is hypothetical to speculate what the result might have been if today's regulations concerning the common treatment of foreign capital in the Andean Group had been in force during this period (1950-71). It is logical to assume there would not have been such a costly outflow of much needed funds. But on the other hand we cannot be sure that the same volume of foreign investment would have taken place under today's rules of investment. The one thing that is certain is that it was an excessively high money price to pay.

I say money price because these are the explicit costs of foreign investment which do not take into consideration net outflows effected by overpricing imported inputs and underpricing exports between units of an international corporation, by non-arms length transactions. The value of these transactions has been established to be far in excess of explicit costs of transfer of technology (including interest, dividends, royalties etc.), in certain industries at least, e.g. in the Colombian pharmaceutical industry declared profits were 3.4%, dividends 14%, and overpricing of intermediate goods 82.6%.¹⁹ The British Monopolies Commission found that Hoffman-Laroche overcharged its U.K. subsidiary by a factor of 123% to 161% for intermediate products.²⁰

The fact that the branches of industry most controlled by foreign capital were those which imported the most capital goods, intermediate goods and raw materials²¹ makes it apparent that there exists a greater opportunity in the foreign controlled

companies to utilize transfer pricing to reduce declared profits to avoid taxation. In a more recent context, it has been used to reduce the obligatory contribution to the 'industrial community' (comunidad industrial, C.I.), a workers' participation organization destined to share management and profits in 'reformed private enterprise' sector. This sort of manipulation by the multinational enterprise frustrates the social goals of redistribution of the economic surplus.²²

A further criticism of foreign direct investment is brought to light in the following, that backward linkages to the local economy are inclined to be less in foreign owned or controlled enterprises due to the propensity to source inputs from the parent or sister companies abroad. This practise is resorted to for a number of reasons, among them, transfer pricing for tax avoidance, conversion to safer hard currencies, and due to the tariff structure in Peru. However, from the point of view of the host economy, sourcing abroad seriously limits the development of local supply industries.

We come now to the question of research and development (R & D). Peru's experience has been the same as most other countries in the industrial periphery. Little R & D is done in Peru by the subsidiaries of multinational corporations (MNCs). The MNCs can easily justify their R & D strategy through an economic rationale. It makes economic sense to establish a miniature replica of the parent production function to get inside a tariff barrier or to open a new market, but a local R & D operation would be too costly in relation to the relatively small volume of the local subsidiary. It has been done though and it does make sense in an

alternative corporate structure where the local operation is a specialized division interrelated with other divisions under a "product charter concept" assigning a set of product categories to each division.²³ Then R & D can be decentralized, to the advantage of the host country which builds up a cadre of researchers in the particular field. Unfortunately this type of international division of responsibilities is relatively rare.

Without the *raison d'être*, a demand derived from industrial needs, research and development centres, in-house or contracted, simply do not develop spontaneously. There is little demand for, or opportunity to train, the number and type of highly qualified human resources required to staff a viable industrially-oriented R & D operation. Thus Peru, like many other developing countries, finds herself confronted with the serious problem of attempting to liberate herself from economic dependence, largely seated in technological dependence, and without the means to do so. This, of course, is the price of liberal investment policies in the past, of letting someone else do it for her. Again, it is impossible to estimate what different policies might have achieved. Perhaps we can judge better ten years hence.

The Revolutionary Government of the Armed Forces, attempting to remedy past errors in investment policy, and has adopted policy initiatives in this direction. But more of the actual policies and instruments later. Suffice it to say at this point that foreign-controlled industrialization generally fails to develop R & D-oriented HQHR in the host country, nor does it actually transfer the necessary technology to

any meaningful extent.²⁴ Therefore it is incumbent on the host government to implement policies to build the necessary scientific and technological infrastructure if it is serious in its ambitions to become relatively independent, economically-and technologically-speaking. I emphasize "relatively" because it is impossible to be completely independent in today's increasingly interdependent world. But there are degrees of dependence, and Peru's degree of dependence is obviously unacceptable to her government and people.

Another type of frustration of the development of HQHR is the use of expatriate personnel, usually brought in to fill key posts in management, production, finance and accounting in foreign controlled enterprises. Sometimes this is justified, initially at least, due to the unavailability of qualified personnel in the host economy. However, I suspect that the strong reluctance on the part of the MNCs to phase out these experts is a function of the desire to maintain control of critical accounting procedures (i.e. for transfer pricing) and technology embodied in HQHR. This practice, of course, hinders the development of national HQHR. Once a government has demonstrated the political will and social control to industrialize indigenously then capital accumulation, access to industrial technology on reasonable terms, available physical resources are all indispensable components of the industrialization package. But without the planners, managers, engineers, scientists, technicians and skilled labour a developing country will remain dependent and underdeveloped. It will have to rely on outsiders to fill these key industrial functions and regardless of appearances, (i.e. 51% local ownership etc.) will suffer a degree of loss of control.

It is the central thesis of this paper that properly qualified human resources are a nation's greatest asset and the key to relative technological independence. If the development priorities are to industrialize, then it is imperative to set about providing the proper mix and numbers of HQHR needed to implement the National Development Plan. The RGAF has decided that Peru must industrialize indigenously to provide employment and become as independent and self-reliant as possible within the framework of the Andean Group. She has taken this tack as a result of the history of foreign domination of her industry and mining sector. Furthermore, she has tremendous pride and wants to shed the last vestiges of dependence.

On a regional basis Peru has been a leader in establishing the Andean Group regulation of foreign investment. On a national basis the Plan Inca has been devised to rectify the errors of the past. Economic development is a major goal of the plan, but controlled economic development to benefit all Peruvians, not just the fortunate few local intermediaries in the foreign-dominated mining or manufacturing sectors along with the latifundistas in the agricultural sector. The Revolutionary Government of the Armed Forces places a high priority on redistribution of the material wealth of the country and the improvement of the earning potential of the formerly marginalized population.

The instruments to achieve this redistribution of wealth and

increased earnings are the Agricultural Reform Law (1969) and the General Law of Industries (1970). The Agricultural Reform has expropriated and redistributed 5,663,558 hectares to the former sharecroppers or tenant farmers as of July 1975.²⁵ Although there is a prescribed limit of 30 hectares per individual in the Sierra and 50 hectares per individual in the coastal region²⁶ the government recognizes that small landholdings are not always the most efficient nor productive units and that the campesinos will require quite a bit of assistance in the transition period from quasi-serfdom to mini-entrepreneur and/or cooperant and participant. The mechanisms devised to create employment, better manage and market agricultural production are the cooperatives and the Social Property Enterprises²⁷ which are planned to replace the cooperatives eventually. These new forms of productive organization will require literate, socially aware and committed participants, as well as managers, accountants, agronomists and agricultural technicians. Hence the emergence of an important task for education, one that the Educational Reform anticipates and attempts to deal with realistically. We will enlarge on this aspect of the role of the educational sector and the Reform in the section dealing with education specifically.

The Ley General de Industrias (General Law of Industries) replaced the Industrial Development Law as of July 30, 1970. It sets the priorities for economic and social development within the sector and the country. Industry will receive incentives according to its relative importance to developmental objectives. Basic industries²⁸ are reserved to the state, with some flexibility to allow the private sector to participate

where appropriate. Employees of industry will participate in profits in two ways. The enterprise will distribute ten percent of its net pre-tax income to its employees in cash annually and will also allocate fifteen percent of net pre-tax income for employee share equity in the firm, accumulating to a maximum of fifty percent equity over time. The beneficiary employee organization is known as the 'comunidad industrial' (industrial community) and will be represented by a minimum of one member on the board of directors, on creation of the industrial community, and subsequently in proportion to its equity holdings. The final major dictum of the General Law of Industries states that two percent of net pre-tax income must be directed toward scientific or technological research within the enterprise, approved previously by the state supervisory entity ITINTEC (Instituto de Investigación Tecnológico Industrial y de Normas Técnicas = Institute of Industrial-Technological Research and Technical Norms), or turned over to ITINTEC for use in research to be performed by third entities.²⁹

This law, along with the Agricultural Reform, is designed to establish more equitable ownership of the means of production and distribution of the economic surplus. With the creation of state-owned commercial enterprises in the appropriate fields this law establishes state control over national resources.³⁰ Decision 24 of the Grupo Andino (Andean Group) to regulate foreign investment in the subregion is institutionalized in Peru through Decree Laws 18900 and 18999.

Through this cluster of instruments and mechanisms the government of Peru hopes to regulate industrialization for the benefit of the country

and the people. The government hopes to avoid the distortions occurring under the previous model of industrialization and hopes to stimulate investment in areas that will correspond to the social and economic needs of the country.

What has all this to do with education? Well, as in the case of agricultural reform, these industrial reforms and regulations creating new national responsibilities in new institutions and increased national participation in Peruvianized industries at the highest levels creates an unprecedented demand for highly qualified human resources, (managers, accountants, scientists, professionals, technicians and skilled labour) plus a literate and better educated work force to permit useful dialogue between the leaders and the led. For example, there is a distinct need for agricultural technicians at the field level. These will apparently be much more acceptable and therefore more productive if they are provided by training members of the actual cooperatives or EPS.³¹ Outsiders, in these better paid positions, are resented, and are generally reluctant to remain in the rural areas in any case, because of the lack of amenities and lower remuneration than they would receive in desk jobs in the Ministry of Agriculture. Thus the task for education is to upgrade the basic education level of all, especially those selected to perform these specialized functions in the coop or EPS, and to give them professional expertise in their field as well.

The government has designated certain industries 'basic' and has reserved the direction and development of these for state enterprises. Existing private enterprise has been reformed to gradually give the workers fifty percent equity and an equal voice in management. The government

has designated the Social Property Enterprise (EPS) as the primary form of productive organization. Apparently all new small and medium-sized investment in agriculture and industry will be promoted in this form, gradually replacing cooperatives as the dominant form of social enterprise.³²

Peru, determined to break out of the economic dependence associated with direct foreign investment, has nationalized key industries and is attempting to develop an indigenous scientific-technological capacity. The particular blend of institutions and mechanisms that the government has constructed to promote socio-economic development that is neither capitalist nor communist is becoming known as the Peruvian Model.

This model relies heavily on highly qualified human resources, on skills and attitudes that will have to be developed in the formal and non-formal educational system at all levels from initial education to university. Chapter II will examine in more detail the demands on education deriving from the Peruvian model of industrialization.

NOTES TO CHAPTER 1 AND

INTRODUCTION

¹With the Peruvianization of resource and basic industries a demand has been created for indigenous management and specialized HQHR. While it may not prove to be feasible to replace all the non-Peruvian experts now working in these and other industries (approximately 2,110 as of June 1975 - see Annex 1) the majority will be replaced over time.

²Peruvian imports of basic food have risen from \$5 million in 1968 to \$500 million presently: Excelsior, Mexico City, 8/9/75.

³The lack of agricultural land is explained by the importance of areas not suited to agriculture (mountains, deserts and forests). The geographic distribution of land is as follows: - arable land 2.2%, natural pasture 21.5%, areas unsuitable for agriculture 76.3%. The availability of land per capita is one of the lowest in the world. Agrarian Problems and Development in Peru, Manuel Truchis.

⁴Arable land is so scarce that only 8% of the farm families in the Department of Ayacucho are scheduled to benefit from the sweeping land reform being carried out by the present military government. Field Staff Reports, Vol. XXI. No.4, Part II, p. 3. The statistics cited are taken from Bases para un Programa de Desarrollo Nacional a Largo Plazo (Lima, April 1969), p. 137.

⁵Peru, Challenge and Response, INDUPERU, 1971. p. 175.

⁶"In the provinces of Islay, Arequipa, Camana and Caraveli of this southern department the Agrarian Reform is still incipient. There exists a feudalistic agrarian structure of parcelation which has resisted the advance of the Agrarian Reform thanks to the politico-economic power of a group who are continuing to feed on the poverty of the real campesinos." La Cronica, Lima, 7/12/75.
"The slowness of the Agrarian reform is due to the lack of credits, inputs, technical assistance and even by the mentality of a considerable majority of campesinos and conservative generals, friends of the gamonales." Saturnino Huilca, agrarian leader in Peru, quoted in Miguel López Saucedo, Excelsior, Mex. 18/9/75.

⁷Sector Assessment (Draft) Education, USAID/PERU, August 15, 1975, Section IV, p.23.

⁸La Prensa, Lima, Editorial - Plan Sexenal del Gobierno Revolucionario, quoting President Morales Bermudez in interview in Mexico 26/11/75.

⁹La Prensa, 29/11/75, Minister of Agriculture General Gallegos Venero - "The EPS will measure the success of the Revolution".

¹⁰La Prensa, 10/12/75. President Morales Bermúdez. Also according to a release from the Office of Public Relations the government has supported Social Property Enterprises (EPS) to the extent of 3,590 million soles (\$513 million, approx.) in the last 18 months through financing from COFIDE, the Central Bank of Peru, development banks and associated banks.

¹¹Miguel Wionczek, U.S. Reaction to the Andean Group System of Treatment of Foreign Capital.

¹²Eduardo Anaya Franco, Imperialismo, Industrialización y Transferencia de Tecnología en el Perú. Editorial Horizonte, Lima.

¹³Anaya Franco, pp. 76, 77.

¹⁴Ibid., p. 28. N.B. Due to Peruvianization of basic industry and recent heavy foreign investment in the mining and petroleum extraction sectors the emphasis probably has swung back.

¹⁵Ibid., p. 93.

¹⁶Ibid., pp. 84-93.

¹⁷Ibid., pp. 21, 22.

¹⁸Ibid., p. 29.

¹⁹Ibid., p. 94, extracted from a study by C. Vaitzos. N.B. Corporación de Fomento de Chile had similar findings. In a survey of 19 firms overpricing ranged between 0% and 30% in 6 of them, 31%-100% in 3 others, and over 100% in 10 firms.

²⁰British Monopolies Commission Report on the Supply of Chlordiazepoxide and Diazepam. 17/4/73.

²¹Anaya Franco, p. 94.

²²A study of Good Year Co. of Peru's financial statement by the accountant of the Comunidad Industrial disclosed that Good Year had, according to Article 21 of Decree Law 18900, been unduly remitting to its parent company in the U.S.A. payments for technology and technical

²²(Cont'd.)

services. The total amount involved over a three year period was 120 million soles, (\$2,790,000) 10% of which should have been distributed to the membership of the C.I. as participation in the profits of the enterprise, and an additional 15% that should have been allocated to the purchase of company shares by the C.I. - La Prensa, Lima. 28/10/75.

²³Litvak and Maule, Dual Loyalty, p. 83. Admittedly in the case cited in this book the government had some leverage as it was a client of the local subsidiary.

²⁴See UNCTAD, TD/B/AC.11/20, p. 36.

²⁵Excelsior, Mexico City, 18/9/75. Also-Prime Minister General Oscar Vargas Prieto asserted that by June 1976 the latifundistas would all have been liquidated. He also stated that as of the end of 1974 the Agricultural Reform had demanded the expropriation of 6½ million hectares of land and 1.8 million head of cattle. La Cronica, Lima, 12/11/75.

²⁶Decreto Ley No. 21333, cited in La Prensa, Lima, 12/12/75.

²⁷La Prensa, Lima, 28/11/75. p. 17, Cooperativismo: se Acercan las Definiciones, Juan Vicente Requejo.

²⁸Basic industries are given first priority and are in the hands of the state. They are: - iron and steel, non-ferrous metallurgy, basic chemicals, fertilizers, cement and paper. - Peru, Challenge and Response, p. 117.

²⁹Ley General de Industrias, cited in Information Guide for Doing Business in Peru, Price Waterhouse, Peat and Co., p. 58. Government sectorial enterprises: - INDUPERU (industry)
MINEROPERU (mining)
EPCHAP and EPSEP (fisheries)
PETROPERU (petroleum)
ENTELPERU (communications)
COFIDE (investments)

³⁰Ibid.

³¹USAID/PERU, Section IV, pp. 21, 22.

³²Ley de Cooperativas: cooperatives will be incorporated in Social Property Enterprises, but not in a compulsive fashion.

CHAPTER II

DEMANDS ON EDUCATION

In a recent speech to the Annual Conference of Executives, CADE (Conferencia Anual de Ejecutivos) in October 1975, President Morales Bermúdez emphasized the role of Peru's own industrial technology. He admitted that it was only recently that the importance of developing indigenous industrial technology had been understood. This was seen in the light of the fact that Peruvian industry was "fundamentally only the final stage of productive processes realized almost entirely abroad", and that "there had been a proliferation (in Peru) of assembly or transformation enterprises using imported inputs". The President further stated that national enterprises had been too long "without creative capacity", and were submitted to the onerous terms of purchase of foreign technology, and unable to export their products competitively.¹

The gravity of Peru's position is illustrated by the growing deterioration in her balance of trade. This has gone from a surplus of \$334 million in 1970 to a deficit of \$1,000 million in 1975.² The explanation offered for this negative balance of trade is the limited expansion of the volume of production exported and the deterioration of the prices of exported raw materials. On the other hand, imports have increased spectacularly in the same period, from \$700 million in 1970 to almost \$2,500 million in 1975, due equally in the increase in volume as to the increase in prices.³

To put these statements in context a few facts may prove helpful. First, the price of raw materials is exceedingly important to Peru as "an average of 95.3% of Peru's exports was composed of raw materials (1960-69).

These raw materials, incidentally, are exported almost in their native state without undergoing any refining process, (except fishmeal and sugar). Of the balance 3.2% were basic secondary products, and only 1.5% were manufactured goods.⁴

The concentration of these raw material exports was heavy in two products, copper and fishmeal, these representing 54% of the total exports in 1969.⁵ While the prices of these products were relatively high they provided Peru with a good source of foreign exchange, which strengthens her balance of payments position and increases national income. However, these products have not proven to be reliable sources of income due to fluctuations in the price of copper and the disappearance of the anchovy. Thus export earnings remained stagnant in face of dramatically increasing imports.

With the exception of sugar and coffee, all major Peruvian export products have been adversely affected by current price developments.⁶ Copper prices and fishmeal volume remained low, contributing to the zero growth in value of exports while imports in 1975 have increased 30.5% (See Annex VIII).

The extraordinary increase of the past two years have been caused, in part, by increased food and oil imports. Wheat imports cost Peru \$101 million in 1973 and were expected to reach \$170 million in 1974. Petroleum imports in 1973 were \$32.7 million as compared to \$120-130 million in 1974. The latter will be slightly offset by the increased value of Peru's petroleum exports to Brazil, (\$35-40 million in 1974 vs. \$10 million the previous year).⁷

Peru is doing a fair job in rectifying the portion of the trade deficit caused by petroleum imports, and hopes by dint of development of internal

sources to be self-sufficient in oil sometime in 1976.⁸ The problem of food production, however, remains serious. The slow rate of growth in agriculture compared to the rapid rate of population growth, 3.1%, forces ever increasing imports of food. These were \$54.9 million in 1960, \$89.1 in 1964 and \$150 million in 1969.⁹

While these two items are important factors in the recent phenomenal growth of imports, they are not the whole problem by any means. The increased cost of imports of wheat between 1973 and 1974 was \$69 million, and petroleum \$67.3 million. Together then they accounted for only \$136.3 million of a total increase in imports of \$876 million between 1973 and 1974 (See Annex VIII). What other factors were involved?

There is an increasing and important trend to import inputs for Peruvian industry. In 1960 28% of inputs in industrial production were imported. In 1969 this percentage had risen to 37%.¹⁰ This then is the area of concern of Peruvian planners in the industrial sector. Seen from the Peruvian point of view the remedy for this state of affairs lies at least partly in greater national control of natural resource industries and basic industries, banking, communications and key sectors in general, to re-establish national priorities in industry (i.e. source more inputs locally) and mining traditionally dominated by foreign capital with external priorities.

Faced with a difficult situation the RGAF has taken several major policy decisions in the industrial sector. The first was to promote the growth of existing basic industries and create new industries in this category when necessary. These basic industries are: iron and steel, non-ferrous metallurgy, basic chemicals, fertilizers, cement and paper. The state will control these industries and they will be given first priority.¹¹ Other priority industries

are open to private capital but the state has assumed a very important entrepreneurial role in the industrial sector. There will also be imposed greater control on the outflow of profits, royalties etc. through national and sub-regional regulations on foreign investment, to encourage the needed investment to be more responsive to national social and economic priorities.

The State enterprises created to promote and manage the development program are as follows: COFIDE, the state Financial Development Corporation will act to channel savings into industrial investments. It is intended to act as a state holding company which will hopefully catalyse the creation and/or growth of development-oriented industrial activities, private or state. PETROPERU will manage the entire fossil fuel industry from exploration to refinery. MINEROPERU is the state interest in the mining industry, which will still have a very large private component however. ENTELPERU will have exclusive jurisdiction over communications, EPCHAP and EPSEP are the fisheries production and marketing enterprises, and INDUPERU will operate existing state enterprises in the industrial sector and promote the development and growth of new industries. Our main interest is the industrial sector so we shall look at INDUPERU's efforts most closely.

Before we do so it is interesting to note that manufacturing was as of 1973 the second largest sector in the Peruvian economy with 24% of the total economic activity and growing at 7.4% per annum, while agriculture's share was 30.8% and declining.¹²

The Peruvian government's main goals in creating these state enterprises are to establish national development priorities, to substantially reduce imports and stimulate exports. Among the steps to reduce imports contributing to the deficit in the balance of payments are (i) production of a much larger

percentage of components for the manufacturing industry locally (ii) to supply the internal market entirely from local production in certain fields (iii) create an exportable surplus, directed primarily toward the Andean Common Market,¹³ (iv) stimulate employment (v) develop indigenous technology.

The state enterprise INDUPERU (Industrias del Peru) is particularly important to the accomplishment of development goals in industry. Although not all state controlled industry comes under the jurisdiction of INDUPERU most of the new development in this sector does. SIDERPERU, the state steel manufacturing complex, SIMA, the state shipbuilding corporation, and PETROPERU are semi-autonomous entities responsible to the Ministry of Industry and Tourism as is INDUPERU.

Created at the beginning of 1972 INDUPERU has become a powerful instrument for the stimulation of indigenous industrialization in a short time. I will cite a few examples of the industries (i) presently manufacturing, (ii) presently assembling with plans to manufacture the majority of inputs in Peru, (iii) Feasibility study complete and slated for implementation, and (iv) under serious study; to illustrate the industrial growth; operational and anticipated, that INDUPERU, SIDERPERU and SIMAC are creating (see Annex XII).

I will also cite the estimated demand for Highly Qualified Human Resources, (HQHR) and skilled labour derived from this industrial development effort on the part of the major state enterprises.

INDUPERU has under its jurisdiction the following enterprises in Category (i). Presently Producing: Five Cement Manufacturing Firms; total annual production - 2,010,000 metric tons; present employment - 1,583. An Ammonium Nitrate Fertilizer plant producing 50,000 metric tons annually.

Category (ii), Presently Assembling, and Will Produce (with a high percentage of national parts) Tractores Andinos S.A. assembled 500 tractors in 1975 using Massey-Ferguson parts. Production expected to commence in January 1976 utilizing 22% national parts, local content to increase to 62% within 5 years. Production will reach 2000 tractors per annum per shift; market - national with flexible capacity to meet potential demand in Andean Market. Maquinas Herramientas S.A. presently assemble; will produce in second quarter of 1976; products - lathes and drills; national content - 90% within 4 years.

Category (iii) Feasibility studies complete, contracts signed for technology and machinery; imminent implementation; Motores Andinos S.A. will be in production by end 1976; Perkins and Volvo participation, Product - diesel motors ranging between 40HP and 330 HP; production - 15,000 p.a. in two shifts; employment - 700, market - 80% national, 20% available for Andean Common Market; national content - initially - 18%, by 1979-71%. COMPASA Compresoras Andinas S.A. scheduled to begin operations 1977 - product - air compressors to 40HP: production - 3,600 p.a. employment 122.

Newsprint Mill; machine purchased from Finland 24/2/75 at a cost of \$18,604,651. Start up date - 1977; production - annual value \$30,000,000; product - newsprint from bagasse; employment - in construction phase - 1,200, operation - 350. N.B. will save \$30 million in foreign exchange annually and produce exportable surplus as well.

Integrated Petrochemical Complex: feasibility studies complete, negotiating technology; product - polyvinylchloride (PVC) synthetic rubber, polystyrene, propylene etc. - market 55% internal, 10% Andean Common Market, 35% ROW; target date 1980.

Other INDUPERU projects less advanced but definitely planned for implementation in the near future (to 1980) pharmaceutical chemicals, bleached pulp mill, sodium carbonate production due on stream in 1978-79. Grey and nodular founding, automotive forging, copper laminates and extrusions, all due in 1978. Machine tools for metal forming and carpentry (1977) telephone exchanges (1979). Three wood product industries (1978, 1979, 1982). The above industries will incorporate from 60% to 100% national inputs, the majority utilizing over 80%. One of the most ambitious projects on the INDUPERU drawing boards is the Nazca steel complex whose feasibility studies were recently completed. The chances of implementation of this project, (it is admittedly still on paper) were enhanced by the nationalization of Marcona iron mines July 25, 1975. A public commitment by the President of Peru on July 28, 1975 assured that the huge complex will go ahead. The initial capacity is scheduled to be 1.5 million tons of steel, (3 times the present production of SIDERPERU) and it should employ 5,000 directly, many of these highly qualified, as we shall see when we analyse the manpower needs of SIDERPERU. This project should be the springboard for industrial development in the southern part of Peru, and much needed when you consider that 66% of the manufacturing activity of the country takes place in the Lima area and 71.4% of the labour employed by the manufacturing industry works there.¹⁴

In assessing the impact of INDUPERU's projects on the demand for HQHR we must also note that they have projects programmed for the Trujillo area alone that will employ 2,030 persons directly and 9,300 indirectly. These projects are well advanced with serious commitments for machinery,

technology contracts signed, buildings under construction, etc. If we add the above employment creation to the positions scheduled to be created in the medium term, as mentioned earlier, including the Nazca Steel Project, we arrive at a direct employment creation figure of 18,500, of which 3,317 will be skilled, technical or professional. The educational system and industrial training system may be hard put to cope with this demand unless immediate action is taken to improve the output and quality of industrial technicians and professionals.¹⁵

Two other major state enterprises that can influence manpower demand substantially in the industrial sector are SIMAC (Servicio Industrial de la Marina-Callao) and SIDERPERU. SIMAC is the state shipbuilding enterprise. It has recently expanded its complement of approximately 2,000 workers in 1974 to 3,454 in 1975 and is still growing; having substantial future orders on hand. Estimates of their manpower requirements put the total complement at 5,000 in 1978, increasing to 6,000 in 1980. At present 350 or 11.2% of the total are engineers and technicians, and they are short of technicians.¹⁶

SIMAC has recently launched its first 25,000 ton tanker. The quality of work, especially the finish, has been adjudged to be superior to the quality of finish in U.S. and European shipyards.¹⁷ SIMAC is an excellent example of the real transfer of technology. Fifteen years ago there were 50 foreign professionals and technicians on staff. Today there are only 3, and two of these are married to Peruvians.¹⁸ This is proof of the capacity of Peruvians to absorb technology and the high quality of Peruvian workmanship, given the proper organization and training of qualified professionals, technicians and skilled workers.

SIMAC has a very good in-house training program. It ranges from EBL (Educacion Basica Laboral), the non-formal upgrading of workers' education, to apprenticeship training for skilled labour, to special courses for professionals and technicians, in-house or in universities and industry in Peru and abroad. This training service is necessary because formal training institutions are not able to train skilled labor up to industry's standards. "There is no skilled labor, or at least, not skilled enough to commence immediately in industry."¹⁹

SIMAC has an excellent attitude toward training outsiders, giving the university undergraduates the opportunity to gain practical experience through 'prácticas profesionales' during their summer holiday period.²⁰

This training and upgrading of skills pays dividends. In one year, through concentrated welding courses SIMAC was able to improve tons steel per man hour productivity 15%.²¹

SIDERPERU and its associated industries were the subject of an intensive manpower study of the Chimbote region in the department of Ancash. Let us now look at the future demand for professionals, technicians and skilled labour in this group.

The numbers of highly qualified and skilled manpower required in the near future are impressive, particularly if the associated industries are taken into account. By 1981 SIDERPERU will need an additional 232 engineers and 105 other professionals, plus 855 technicians and 911 office workers (empleados). Their needs in additional skilled workers will be 1,222, semi-skilled 1,267, and unskilled 711 (see Annex IX). If we include the associated industries as well, the number of technicians increases to 2,012 in six different specialities, and the number of skilled workers

rises to 3,606.

Dealing strictly with the managers, professionals and technicians in the total manufacturing sector, said group numbered 10,713 in 1970, representing 7% of the economically active population in the sector (150,512). The requirements above for professionals and technicians for industries managed by INDUPERU, plus those for SIDERPERU and SIMAC, up to 1981, amount to 4,579 or 42.7% of the existing stock of managers, professionals and technicians in the manufacturing sector.²²

Admittedly these three major industries probably represent the greater part of the demand for highly qualified personnel within the sector. Furthermore it is possible that for one reason or another some of the industrial projects of INDUPERU may not come on stream as quickly as planned. I have tried to indicate by the categorization of these projects the probability factor for immediate implementation. The SIDERPERU and SIMAC expansion plans are now in motion and therefore **certain**. Therefore I think it is fair to say that there exists a substantial demand for HQHR in the manufacturing sector and that it will certainly put a strain on the educational and training system unless the quality and capacity of the system is upgraded quickly as the HQHR requirements are for the short term.

As mentioned earlier there is no possibility, according to the ORDEZA study, for the universities, colleges and technical schools in the region-Chimbote, Ancash, to supply the needs of SIDERPERU and associated industries. On a national scale there seems to be no doubt that there are sufficient numbers of engineers and other professionals graduating within the period (1975-81) to satisfy the above requirements. SIDERPERU

has been successful in attracting professionals from Lima, universities and elsewhere. So the only problem in this category would seem to be adapting the available supply of professionals to industrial needs, a task which SIDERPERU and SIMAC have proven capable of doing.

In the technician category the supply is not assured. The statistics on the supply of industrial technicians are notoriously scarce and inconsistent in their categorization. A MOE(DETES) study of registrations and graduates of the higher technical centres of study indicates a total number of graduates in all specialities of 2,701 for the year 1974. In the specialities that could be conceived as useful to industry we find 1,714. Of this group 1,385 were in the Business Administration category. Actual production technicians totalled 254 according to this study, a pitifully small number. There were, however, 1,687 students registered in courses leading to industrial technical professions.²³ Hopefully there will be larger graduations in future years of this vitally needed group which make up approximately 2/3 of the professional and technician category of HQHR required by the three major state industries, projecting their manpower requirements to 1981 (this would mean 3,054 technicians).

The MOE was approached by regional authorities and plans now call for an additional ESEP in Chimbote by 1977. It will be oriented to SIDERPERU's manpower needs in the technician and middle level management category. The ESEPs in general are designed to alleviate the shortage of these categories. The nine present ESEPs have 5,509 total registrations in the first year of implementation, 1975, and 1,766 (or 1,886, depending on interpretation) registered in industrial professions, who are scheduled

to graduate in 1977. However, the quality of the future ESEP graduates is extremely important. In the early sixties Whyte and Flores found that "While over 30% of the work force in manufacturing is reported to be skilled or semi-skilled, management people often complain of lack of knowledge or skill of workers officially in these categories."²⁴ My interviews with management in industry confirm this weakness in the quality of middle management still exists. Unless the ESEPs turn out quality graduates this problem will probably persist.

There are two other categories of demand for education that are important for industry. The first and most numerically demanding is the need to upgrade the general educational level of the average worker to make effective dialogue possible, which should help to avoid costly and needless labour stoppages. Still in this general area is the need to improve the management and accountancy skills of the thousands of leaders and members of the Comunidades Industriales and Social Property Enterprises being created in keeping with the structural transformation within the industrial sector. This will be achieved through extended general EBL courses in the enterprise and through short term specialized courses in the regions.

Finally, there is the demand within the sector to upgrade the knowledge and skills of professionals through post-graduate training. The Ministry of Industry and Tourism has done a study on the needs in this area. A summary is presented in Annex X.

The foregoing has dealt primarily with the operational aspect of industrial development and external demands on the educational and training

system imposed by industry (manufacturing). We should now consider the important issue of development of indigenous industrial technology so strongly emphasized by President Morales Bermúdez in his address to CADE '75. The government's policy and instruments in the development of a technological infrastructure and the implications for demand for HQHR for this area of endeavour will be discussed in Chapter III.

NOTES TO CHAPTER II

¹La Prensa, Lima, 20/10/75.

²La Prensa, 6/10/75, Economia Peruana, La Balanza Comercial.

³Ibid. Over the period discussed the prices of Peru's raw material exports experienced a mild decrease between 1970-72, a strong increase in 1973 and the first four or five months of 1974, followed by a brutal descent from mid-1974 to the present. 6/10/75.

⁴Peru, Challenge and Response. Published by INDUPERU in 1971. p. 147.

⁵Ibid., p. 146.

⁶With the exception of sugar and coffee all major Peruvian export products have been adversely affected by current (1974) price developments. Minerals have been hit especially hard. Since April copper and zinc quotations on the London Metal Exchange plunged by 39%; the price of lead dropped by 25%, while silver went down by 18%. In the case of fishmeal the decline was 33%. Quarterly Economic Review. Number 3, 1974.

⁷Ibid., p. 12.

⁸La Prensa, 9/10/75, p. 6.

⁹Peru, Challenge and Response, p. 147.

¹⁰Ibid., p. 118.

¹¹Substantial incentives, primarily in the form of reductions in import duties, tax relief on reinvested profits, accelerated depreciation for a limited period, and favourable credit facilities are made available. Information Guide for Doing Business in Peru, op.cit., p. 59.

¹²Economic Survey of Latin America, 1973, p. 256, table 158.

¹³The Andean Common Market represents a potential market of 60 million consumers. However, like Peru, where in 1969 twenty-seven per cent of the economically active population absorbed 72% of the personal income, the effective market in the Andean Group countries is smaller than the population suggests. Until the agricultural sector can be developed to the point where those working within it are above the subsistence level

¹³(Cont'd.)

there is an upper limit to industrial development within Peru and the Andean Market, given the limited possibilities for exporting manufactures outside the region. However, the Andean Common Market is still the second biggest economic unit in Latin America. Peru, Challenge and Response, p. 117.

¹⁴Peru, Challenge and Response, p. 117.

¹⁵Most of the statistics quoted in this resume of INDUPERU's activities are taken from their public relations release of November 1975, INDUPERU En La Feria, distributed at the Feria Internacional del Pacífico or from El Comercio, Lima, 6/10/75.

¹⁶Interview with Ing. Cesar Romero Chigne, 3/13/75.

¹⁷William Trainor, American Bureau of Shipping, and Canut Vagnes, Norwegian technical advisor to EPCHAP, the Peruvian state fisheries enterprise. 29/10/75.

¹⁸Interview with Sr. Quezada, Instructor, Oficina de Adiestramiento, SIMAC.

¹⁹Interview with Chief Instructor Yataco Oficina de Adiestramiento, SIMAC, 1/12/75.

²⁰Practicas profesionales. SIMAC considers the practice of hiring university and technical students during their summer vacations as a social contribution to the improvement of the practical application of the student's theoretical knowledge. Unfortunately SIMAC cannot possibly accommodate all those who would like to gain such practical experience, however they did accept 64 practicanes in 1974. Sr. Yataco op. cit.

²¹Ibid.

²²The sector statistics are from Recursos Humanos Científicos y Tecnológicos, Sector Productivo, Consejo Nacional de Investigación. The future requirements for professionals and technicians are taken from the ORDEZA study referred to above and calculated using existing ratios of professionals and technicians to total number of employees in the industry, applying this ratio to total future requirements in a conservative manner.

²³DIGES-DETES, Matricula y Egresados Durante los Años 1973 y 1974 de los Centros de Educación Técnica Superior. MOE. (Ministry of Education DIGES= Dirección General de Educación Superior, DETES= Dirección de Educación Técnica Superior.

²⁴Whyte and Flores, High Level Manpower for Peru, in Manpower and Education, Harbison, Meyers.

CHAPTER III

PERU'S SCIENCE AND TECHNOLOGY POLICY: IMPLICATIONS FOR EDUCATION AND TRAINING

The Peruvian government's policy of giving priority to the development of a national scientific and technological capability to assist in building a truly Peruvian industrial sector is well advised. UNESCO studies support this policy. Their 1971 study, 'Scientists Abroad' states, "It has been generally accepted for many years that developing countries must have an indigenous scientific and technological capability in order to increase both production and the capacity to produce, and to make those increases cumulative and self-sustaining. While there may well be other social, cultural, military and political reasons for indigenous scientific and technological capability, the most important is economic development."¹

President Morales Bermúdez finds support for his concern over technological dependency² in the Pearson Commission Report. The Commission's related comment was "As the ability to analyse scientific, technical and managerial problems and propose new solutions has grown in industrial countries, low income countries have become increasingly dependent on technology conceived and produced outside their borders and without reference to their special needs. They will need to devote considerably greater shares of their resources to research and development, if only as a means of economizing their scarce resources and making more intensive use of their potential."³

Traditionally Latin American countries have allocated very little

money or effort to research and development (R&D), industrial or otherwise.⁴ Previous Peruvian governments were no exception. They lacked the foresight and/or political will to enact the necessary legislation to create the institutions and mechanisms that would promote local R & D. This, of course, was due to the very nature of their industrialization program which was designed to entice foreign investment utilizing foreign technology. As previously mentioned in Chapter I there was little incentive for the miniature replica subsidiary to duplicate the parent company's R & D efforts.

Fortunately the Revolutionary Government of the Armed Forces has had the vision and political will to create and finance the institutions that will develop a scientific and technological infrastructure. The initial goals are to create a capability of acquiring foreign technology under reasonable terms, and later to develop the capacity to adapt available technology to Peru's model of development. Eventually the intention is to develop national technology through indigenous R & D.

The first step in this direction taken by the RGAF shortly after assuming power in late 1968 was the creation of the Consejo Nacional de Investigación (National Research Council). It has been considered in some quarters not to have been too effective for technological development, and that it therefore should orient itself to the promotion of scientific research.⁵

In this vein Francisco Sagasti suggests that there should be a clear distinction between science policy and technology policy. In brief, he feels that science policy is directed toward the production of basic and applied knowledge which cannot be used directly in productive activities.

He sees technology policy having as its principal objective the acquisition of technology to be used in productive and social processes, as well as in the development of a national capacity for autonomous decision making in matters of technology.⁶

Given the commitment to indigenous industrialization it became necessary to create a more effective mechanism to develop a national technological capacity. When the RGAF promulgated the Ley General de Industrias (General Law of Industries) in July, 1970, it created ITINTEC (Instituto de Investigación Tecnológica Industrial y Normas Técnicas) to deal specifically with technology matters. Its areas of competence initially were promoting, supervising and carrying out industrial technological research, of preparing national technical norms and standards and of improving quality control in industry, and of performing additional activities such as technical information for industry and training.

As time went on ITINTEC was given additional responsibilities including such functions as dealing with industrial property and of negotiating licensing agreements. (In actual practice INDUPERU, the state corporation charged with industrial development, negotiates the contracts and then submits them to ITINTEC for advice and approval.)

INTINTEC, itself, defined as 'complementary fields for action' engineering and industrial design, export of technology, training of personnel for technological research, and the formulation of industrial technology policies.⁷

Sagasti summarizes the description of ITINTEC's functions by saying, "ITINTEC has become the executive agency for the formulation

and implementation of industrial technology policy".

The RGAF has also created similar technological institutions in other sectors such as mining (INCITEMI) and telecommunications (INICTEL). All of these technological agencies are assured of a steady source of funds derived from the collection of 2% of net pre-tax income of enterprises in the relevant sector. (Exception: mining sector 1%.) This, of course, means the government forgoes a portion of its revenues. Thus the RGAF has demonstrated a serious ~~commit~~ commitment to the policy of creating an indigenous technological capacity by creating and financing the institutions to implement this policy.

What have been the results of this policy and what are the implications for our central hypothesis that HQHR are the critical factor in a policy to acquire, adapt and create industrial technology within the framework of a nation's pursuit of autonomous social and economic development? Fransisco Sagasti, in describing the historical difficulties of building a national technological capacity in Peru, emphasizes the critical importance of HQHR to this goal. He states "Although the lack of high level scientists, technicians, and professionals to conceive and lead reasearch projects constitutes perhaps the major bottleneck in the system, there appears to be a 'hidden capacity' to identify, formulate and carry out research projects, both in industry and the university, so that the shortage of qualified manpower has not proved to be as critical as once was thought.".⁸

I am inclined to agree that there is a latent capacity for technological innovation (not to be confused with basic or original research)

in Peruvian industry that will be mobilized through programs such as ITINTEC is developing and implementing. But this does not exist except where there is the critical mass⁹ of experienced professionals and technicians working in a well organized situation with specific projects and with adequate support. SIDERPERU is such a milieu. Within ITINTEC's technological research promotion program SIDERPERU is involved in a \$1,000,000 project to investigate the possibilities of the direct reduction process utilizing local iron ore, coal and coke and a second smaller project involving reheating low-carbon, cold rolled steel plate.¹⁰ Even without ITINTEC's stimulation or assistance the workers in the auxiliary services maintenance shop in SIDERPERU constructed a heat exchanger reputed to be almost ten times more durable than the imported ones. This same group has in the past fabricated auxiliary tools, which resulted in considerable foreign exchange savings.¹¹ This was possible because SIDERPERU, dissatisfied with the availability and calibre of skilled labour instituted a sophisticated training system of its own to upgrade the qualifications of available manpower.¹²

This latent capacity for technological innovation exists in an enterprise of the size of SIDERPERU with its advanced state of organization, but in few other enterprises. The real question is, in what quantity and in what quality do the requisite HQHR exist? Is it simply a question of providing better administration and financing of useful research projects? Or is it a question of the formal education system producing graduates with a better understanding of the scientific method, the ability to utilize theory to solve practical problems related to Peru's development and the willingness to get involved

at all levels and in all regions of the country? There is no question in my mind that it is a combination of the two elements, better organization of better prepared human resources. I certainly feel that the present educational reform and expansion in all its modalities is a worthwhile investment necessary to assist in the provision of the numbers and the kinds of qualified individuals required to take on the challenge of indigenous industrialization. There is a capacity for technological adaptation in several large state enterprises, but this cannot be equated with original research as these enterprises are not prepared, do not have a separate R & D division, for this.

Sagasti, in spite of his earlier optimism over the "hidden capacity to identify, formulate, and carry out research projects, both in industry and in university" in his paper of February 1975, seems less satisfied with the quality and quantity of HQHR to engage in research directed toward technological independence. I quote from his November 1975 paper on science and technology policy in the Andean region.

"There are also problems associated with the quality of the manpower in science and technology. For example, a survey of seven major institutions in Peru, found that less than ten per cent of the personnel had more than two years of post-graduate training, either in Peru or abroad. This means that the pool of highly qualified scientists and technicians to lead projects is rather small, and that qualitative differences in existing personnel may be even more acute and difficult to overcome than the quantitative deficiencies in the number of researchers.¹³

A measure of Peru's technological capacity is the methodology utilized to acquire technology. Peru is presently at the level of technological

capacity that Mexico and Brazil were at in the 1950s.¹⁴ This is the first stage of rather imperfect transfer of technology in which the purchaser is an interested spectator, supplying principally the associated civil works, but involved through counterpart participation in attempting to learn as much as possible in all phases of the project. This methodology has apparently proved successful in Mexico and Brazil, who have moved up the scale of technological capacity to the point where they have become exporters of technology in certain fields. (e.g. Mexico is supplying Peru part of the expertise in the process of producing paper from bagasse.)

While there is no general policy at INDUPERU as to the method utilized to acquire technology needed for a specific project, the method frequently used is a modified 'turn-key' process. INDUPERU will purchase the necessary technology through a contract directly with the owner of the process in an international competitive bidding procedure, separately from the implementation of the project. The technology is purchased according to national policy as exemplified in the Ley General de Industrias and also in Decisions 24, 84 and 85 of the Andean Pact, which are institutionalized in Peruvian law.¹⁵ An important aspect of the national technological policy is the unacceptability of restrictions on output or sale of products utilizing imported technology, especially as regards the American continent.¹⁶

ITINTEC reviews the licensing agreements, maintains a register of same, and acts as a consultant to state industrial enterprises in the screening process of technologies to be imported.¹⁷

With this package of technology secured, INDUPERU then holds another competition for the implementation contract. The concept utilized

at this point in Peru's technological development is one of 'centralized responsibility'. This means that the successful bidder will be an engineering contractor with the capacity to design the total operation utilizing the technological package previously acquired by INDUPERU. For a fixed amount¹⁸ the contracting firm will supervise procurement of supplies, construction of buildings and setting up of equipment, testing and commissioning. The implementation of the project will be subject to incorporation of national factors, manpower and raw materials, and to the extent possible the utilization of national engineering firms. The whole is to be in concert with national priorities, which were ignored or given secondary importance the manufacturing sector was in large part controlled by foreign capital.

The centralized responsibility could be assumed by INDUPERU or another national entity. This procedure would entail two significant costs, however. It would be cheaper insofar as the contractor's fees are concerned, but would be much more time-consuming and involve a certain risk due to lack of specialized experience. The other limiting factor is the necessity to finance a greater part of the project. The technology supplier in most cases wishes to sell a total package, and when pushed to break up the package will limit the financing to his portion of the project. (i.e. the machinery) All local inputs have to be financed by COFIDE (long term) and Banco de la Nacion (short term). Thus the greater the local inputs the greater the strain on local financial resources.

Included in the licensor's and/or engineering contractor's fee is the responsibility to train national personnel. This will range from the participation of Peruvian engineers in the construction phase of sophisticated process equipment in the factory of the manufacturer, to training Peruvian

process operators for periods of three to six months in the operation of equipment involved in ~~the~~ particular process. Prior to and during the construction ~~phase~~ of the project the contracting engineer is required to set up an office in Peru. INDUPERU will ensure that the greatest number of national counterparts possible will work in close coordination with foreign experts on the project, with perhaps fifty Peruvian professionals working with six foreign professionals, to effect the greatest transfer of technology possible and gain the maximum experience for her professionals.

This procedure, although somewhat awkward and costly, is considered preferable to sending the equivalent number of Peruvian professionals and technicians abroad to gain similar experience. It is felt that even if costs are increased twenty percent on the project it is still cheaper in the long run,¹⁹ and with considerably less chance of any brain drain.

INDUPERU has its own engineering division which is gaining experience working with the foreign professionals and technicians, and they will form the nucleus of a state engineering firm in the future. Other local firms are gaining experience in plant design as well.²⁰ This learning experience will increase the national engineering capacity and help build a technological infrastructure that will lead Peru to a higher level of indigenous technological capacity to select and commercialize appropriate technology. Improved innovative capacity will depend on other factors such as the ability to promote and develop sectoral research institutes, relevant research projects in universities, and continued and expanded industrial effort in this direction.

What ITINTEC and INDUPERU are doing in the way of promoting the training of the professionals and technicians in research projects and in

industrial development could be termed 'situational training', or an informal school and proving ground to develop the indigenous technological capacity sought to reduce dependence on foreign sources of technology and HQHR. However, the formal educational system, along with other modalities of informal training and education, has an important role to play in providing the professionals and technicians, and skilled labour to man these key projects, and the industrial expansion referred to earlier. A few national professionals have qualified themselves (in spite of the inherent inadequacies of the formal educational system (to be discussed in detail in Chapters V, VI and VII) to the high level required to staff the national and sectorial agencies charged with establishing a truly national industrial base. But now it is incumbent on the reformed educational system to supply better prepared human resources in greater numbers to fuel the expansion of existing industry and the entry into new and more sophisticated fields of industrial technology requiring ever better trained managers, engineers, technicians and skilled labour. The progress of the reformed educational system toward accomplishing this task will be the subject of subsequent chapters.

NOTES TO CHAPTER III

¹UNESCO, Scientists Abroad, Paris, 1971, p. 25.

²La Prensa, Lima, Peru, 20/10/75. Also see Chapter II, p. 23.

³Partners in Development, Pearson et al, Praeger, 1969, p. 66.

⁴Excluding centrally planned economies, developed countries are responsible for 98% of the expenditure on research and development, and are spending it on very little related to developing countries' needs. In fact, R & D to develop synthetic replacements for natural commodities (i.e. rubber, cotton, tin, vegetable oils, etc.) is being undertaken to the detriment of developing country exports. Based on uncertain data it is estimated that expenditure in Latin America for R & D is approximately 0.2% of GNP, while USSR devotes 4.2% of GNP to R & D, U.S.A. 3.2%, Western European countries between 1.0 and 2.0% GNP. Scientists Abroad, UNESCO, p. 26, 27.

⁵Francisco R. Sagasti, Framework for the Formulation and Implementation of Technology Policies: A case study of ITINTEC in Peru., p. 34.

⁶Ibid., p. 4.

⁷Ibid., p. 36.

⁸Ibid., p. 35.

⁹The CNI, National Research Council, states in its conclusions of the study Scientific and Technological Potential of Peru, p. 43, "it is definitely a question of the lack of the 'critical mass' to do effective R & D in areas that could compete with the transfer of external technology, especially in the manufacturing industry. The system still finds itself in a formative stage in which it depends almost entirely (on sources) from abroad. R & D activities are split up into a great number of projects of, about \$2,500, which, in the best of cases, reach \$17,000, whose insufficiency need not be demonstrated. More than 50% of the institutions have less than 11 researchers, of whom only 33% are full time; dedicating on the other hand a large part of their time to other activities, perhaps because of the lack of a support structure of auxiliary personnel, which is 0.8 technicians per researcher. The weakness of the national scientific-technological potential which originates in this insufficiency of resources can be appreciated in the low level of development of associated activities. More than 70% of the institutes direct less than 51% of their internal resources to R & D; almost 70% are dedicated to university teaching as well."

Peru has 0.9 researchers per 10,000 population while industrialized countries like Austria, Ireland, Yugoslavia, Denmark etc., have 3-8/10,000.

¹⁰Boletín 13, January 1975, ITINTEC.

¹¹El Comercio, Lima, Peru, 22/10/75.

¹²Interviews with Sra. Violeta Parodi F., Jefe del Departamento de Personal, SIDERPERU, Lima, 8/10/75 and Ing. Luis Tord, formerly, Desarrollo de Personal, SIDERPERU, Chimbote, 10/11/75. SIDERPERU has five or six instructors trained by SENATI to instruct supervisors in the art of training workers. SIDERPERU also cooperates closely with universities affording third and fourth year students the opportunity to acquire practical experience in industry during their summer vacations. SIDERPERU encourages them to do thesis research in subjects related to the steel industry. SIDERPERU also sends professionals and technicians abroad for specialized training when appropriate. Finally, SIDERPERU has a large program going in Educacion Basica Laboral with 700 participants, 200 more in pre-bachillerato and has agreements with SENATI to train SIDERPERU personnel.

¹³Science and Technology Policy in the Andean Common Market Countries, F. Sagasti, Nov. 1975, p. 19. See Annex X for an estimate of requirements for postgraduates for Industry and M.I.T.

¹⁴Interview with Ing. José Torres Urrelo, Jefe de la Division Petroquimica, INDUPERU, 28/11/75.

¹⁵Decreto ley 18900, quoted in Boletín 17, ITINTEC, May, 1975.

¹⁶Torres Urrelo, 4/12/75.

¹⁷Sagasti, Framework etc.

¹⁸Interview with Sr. Ricardo García, Jefe de la Oficina de Desarrollo de Personal, INDUPERU, 2/12/75.

¹⁹Torres Urrelo, 4/12/75. If INDUPERU were to send professionals abroad for the equivalent training they would be incurring considerable expense. There is a 20%-30% chance that this investment would be lost to the country. According to the U.N. Secretary-General's report to the Economic and Social Council, dated June 9, 1970, the overall rate of emigration and non-return for students studying at home and abroad is between 20 and 30 per cent. While there are no figures available for Peru the rate of non-return for Colombia 1964-69 was 28%. Studies did show a much higher rate of return where the student is under a contractual obligation to his government to return, - Scientists Abroad, p. 60.

²⁰Ibid.

CHAPTER IV

EDUCATIONAL REFORM: ORIGINS AND GOALS

Peru's Educational Reform had its conceptual roots in the thinking of the leaders of the revolution. Augusto Salazar Bondy, who has been called the ideologue of the Educational Reform, states that those who occupy the highest positions of political decision making consider education as a decisive factor assisting the achievement and consolidation of structural change which constitute the justification and distinctive mark of this revolutionary process.¹

Peru's Educational Reform, initiated in 1970, was the result of the assessment of the educational system by over five hundred professionals, and was institutionalized by the Decreto Ley No. 19326, Ley General de Educacion, (General Education Law) promulgated in 1972.

The Educational Reform derives from and is influenced by two critical areas of change instituted by the Revolutionary Government of the Armed Forces, the socio-political orientation of the state and the national development policy.² The educational system is seen as a valuable tool to assist in effecting necessary structural change which is the justification of the RGAF's very existence.³ The ultimate goal of education is to assist in the creation of a 'just society of universal participation'.⁴

The structural changes that the RGAF perceives as mandatory are the reaction to a patently unjust society in which a small dominant group often referred to as the "oligarquia" have maintained a privileged position through economic and political power. This power was based in the ownership of most of the arable land and control of industry and commerce through

direct ownership or as the local representatives of foreign capital. In keeping with the goals of restructuring the socio-economic and political relationships in Peru, education is called upon to eradicate illiteracy, to facilitate effective communication and to instill positive attitudes to cooperative forms of productive enterprise. It is further designed to eliminate status consciousness in work relationships and to create self-pride in the individual regardless of whether he works in manual or technical occupations (traditionally considered inferior) or in professional or administrative posts. Finally, it is to prepare workers for the responsibilities of mutual ownership and greater participation in management of Social Property Enterprises, (E.P.S.) which are designed to eliminate the domination of one man by another through the sale of his labour.⁵

These, then, are the philosophical roots of the revolution, with the perception of the educational system as an important tool to assist in the implementation and consolidation of the revolution.

Turning now to the national development policy implications for education, we have seen in previous chapters that indigenous industrialization is a major goal and key building block of Peruvian development plans. If, within the development policy, a people consciously or unconsciously opt for the material blessings of the twentieth century, automobiles, labour-saving devices and home entertainment goodies, they have a choice. They can either produce them at home or buy them abroad. Peru has opted to manufacture whatever feasible at home. I emphasize that this is the choice of the government and national planners, because this

decision has unavoidable implications for education and national culture if the indigenous industrialization policy is to be successfully realized. The burden of this transformation falls largely upon the educational system.

The present leadership is attempting to prepare all Peruvians for a practical contribution to the development of Peru. Education is no longer to be a consumption item designed merely to enhance personal knowledge and prestige. The Minister of Education, General Ramón Miranda Ampuero recently expressed the conviction of the RGAF that education should have more practical aims. "The Peruvian educational reform maintains that all education should be for work, and along with this, it is a question of achieving a meaningful intercourse between (plena confluencia) the educational and the work worlds."⁶

While this new orientation in education is a major step in the right direction to facilitate indigenous economic development, the experience of the developed countries indicates that there are many more exigencies involved than an increase in practical content in the curriculum. Jan Tinbergen, chairman of the U.N. Development Planning Committee, cites some of these exigencies as follows: "certain human qualities are needed if a modern developed society is to function properly....qualities that are required of quite a high proportion of a developed society are an interest in material well-being, an interest in techniques and in innovation, an ability to look ahead and a willingness to take risks, perserverance, and an ability to collaborate with other people and to observe certain rules."⁷ Thus, if we

accept Tinbergen's premise, the task of education is much wider than mere increase in professional or technical training content of the individual's educational career. It is necessary to change attitudes from opportunistic to cooperative, from passive to activist, to lengthen time horizons, to become more practical and less theoretical and humanities-oriented, more technically aware and technically capable, to understand and fulfill the requirements of industrialization. All of this must touch the majority of the population, eventually if not immediately. There must be a wider appreciation of the value of technology at all levels. It is not something to be inserted in the educational system only at an upper secondary level. It should begin at the initial, or pre-school level, and be continued to the level of adult education. Stanley A. Hetzler states "The child of the emerging society must acquire the skills of the technological society and, as well, a grasp of its problems, because if his society is successful in development he will one day live in this type of milieu."⁸

In view of the importance attached to attitudes to technology I feel it is important to look at the situation in Peru and other Latin American countries concerning the low regard in which technology and any sort of manual labour are held. Authorities on the subject indicate that historically there has been no author of novels of any status who has treated technology as "a legitimate, valuable part of Hispanic culture."⁹...."and hostility to technical pursuits can be traced back hundreds of years in Hispanic culture.....The generalization that manual labour and

technical activity have low social status is largely accurate for almost all of Latin America since independence.¹⁰ The sources of this concept of historical contempt for manual labour appear repeatedly in the writings of prominent Latin American writers on Latin American psychology.¹¹

Probably the most important writer on the Peruvian scene in the twenties, still widely respected for his perceptive analysis of the 'Peruvian reality', was José Carlos Mariátegui. His historical review and analysis of Peruvian education contains many references to the colonial legacy of the Spanish that has been a major factor in the historical non-industrialization of Peru and other Latin American countries. He cites the persistence of the literary and rhetorical orientation as typical foundations of the five leading colleges of the Peruvian Republic. The cult of the humanities permeated the liberals, the old landholding aristocracy and the young urban bourgeoisie. All conceived of universities as factories to produce the learned and the lawyer. There was no one to complain about the lack of practical orientation to stimulate work and to push youth into commerce or industry.¹²

Mariátegui also cites Dr. Manuel Vicente Villarán, who represents the 'demoburgués' thinking in the debate on Peruvian public education, as follows: "Peru should, for a thousand economic and social causes, be as the United States has been, the land of farmers, settlers (colonos), miners, merchants, workers; but the misfortunes of history and men's will have resulted otherwise, converting the country into a literary centre, country of intellectuals and seedbed of bureaucrats."

The typical family of the period feared the risks and worries of manufacturing and commerce and preferred their sons to become lawyers,

doctors, clerks, literati and teachers.¹³ Mariátegui himself emphasized that Spain of all the Latin countries was least able to adapt itself to capitalism and liberalism. This weakness was responsible for the decline of Spain, says Mariátegui, and was inherited by her colonies, who in turn were unable to escape the aristocratic tradition with all its prejudices against 'industrialismo y maquinismo'.¹⁴ Worst of all, states Mariátegui, was the strong association of ideas which was established between work and slavery, because in fact there were no workers that were not slaves, which led to "An instinct, a natural repugnance...for all peaceful work and led one to believe that work was bad (malo) and dishonourable".¹⁵ Education is given the awesome task of eradicating the vestiges of this dysfunctional attitude for industrialization and development.

I know that the appeal of indigenous industrialization is strong, and that relative technological and economic independence are desirable guarantees against the kinds of external pressures that Peru has felt in the past. But I feel that the cultural transformation associated with successful indigenous industrialization may not be fully anticipated nor appreciated. Can technology and manual labour be given the status necessary to induce the numbers and quality of technicians required by industrialization plans? Can a meritocracy be created in Peru to replace the personal connection syndrome?¹⁶ Are Peruvians willing to adopt a pragmatic, socially levelling technocracy which, although efficient for industrialization, is counter to many of the inherited Hispanic values referred to above? Are the cultural costs worth the material benefits, or are there alternative solutions?

There are indications that some of the problems involved in preparing

the necessary qualified human resources for industrialization are recognized and the Educational Reform is attempting to solve these. The General Report on the Peruvian Educational Reform points out some of the salient weaknesses of the traditional educational system in the preamble to the description of the Reform itself. It states; "Much can be said about the absence of significant content in the diverse branches and levels of our education, of the exaggerated intellectualism or memorization which prevails in teaching practise and in the act of learning, to the almost total omission of a sense of creativity which all education should have. Students do not even acquire basic skills, like intelligent reading and reflexive thinking, nor are they qualified for any useful and productive activity. They are directed toward precisely those university careers which have not been duly organized, diversified or evaluated as to their social and economic importance." The importance of re-orienting the attitudes of teachers and students to change the traditional emphasis on rote learning with its literary and rhetoric orientation inherited from Spain¹⁸ has been recognized. The further understanding that attitude change starts early is exemplified in the recognized importance (i) "that scientific and technological education cover all levels of national education, from its elementary grades, embryo of the investigative and creative spirit, up to the higher studies cycles where the most original contributions to human knowledge are produced....and that it make possible a real revolution in concepts and methods",¹⁹ and (ii) that there be qualification of personnel necessary to impel (impulsar) the structural changes and the expansion of production in the industrial sector."²⁰

Thus two of the major goals of the Educational Reform are the

development of critical awareness and the preparation of human resources for productive activity, which are derived from the twin goals of technological independence and indigenous industrialization.

If we accept the preceding analyses of the historical reasons for negative attitudes toward manufacturing and commerce, 'industrialismo and maquinismo', to work in general and manual labour in particular, as indicating basic impediments to industrialization, then perhaps the most important function the educational system can perform for technological independence and indigenous industrialization is to instill positive attitudes toward science, technology and practical occupations in the youth today. Although the new orientation toward generalized vocational education is important there is only so much the formal education system can do to prepare human resources for the labour market, and then it is up to the non-formal educational training systems to finish the job, giving the students practical experience and specialized training. In Peru that is achieved through "prácticas profesionales"²¹ in industry during students' vacation periods, and upon employment via apprenticeship and other in-company training schemes.²² SENATI (Servicio Nacional de Adiestramiento de Industria y Turismo) and Calificación Profesional Extraordinaria (CPE) are effective in upgrading industrial work skills of youth and older workers, SENATI in a more formal setting and C.P.E. in a more flexible, non-formal modality.²³

The Reformed Educational system is more flexible and is now performing a valuable function in that it is upgrading the level of general education of the workers in evening courses in Educación Básica Laboral²⁴ with the involvement and support of industry to organize and finance these massive EBL programs. EBL should make the experienced and technically

qualified worker more liable for promotion, more productive and efficient.

However the basic task of the educational system in the national development effort is to inculcate new values in the future labour force and in the future researchers and technicians. Positive attitudes toward productive labour must be promoted. The practical application of theory must be introduced and developed so this is not an alien concept to the new entrant to the labor force.

Finally, among the most important factors, if not the most important factor, involved in the development of the positive attitudes and skills referred to above is the teaching profession. If the existing teachers at all levels of education, primary through university can be converted (and it is a missionary project which has not achieved anything like the success hoped for so far) to the goals of the Reform and national development, then they in turn can convert the students, Peru's future labour force and developers of industry. The example of the conversion of the Peruvian military by the progressive professors of the CAEM (Centro de Altos Estudios Militares)²⁵ to a motivated and concerned force for change and development instead of the traditional Latin American military support of the status quo and conservatism is proof of the power of dedicated teachers.

Before attempting an analysis of the progress of the Educational Reform in producing the skilled and highly qualified human resources required to achieve relative technological independence and indigenous industrialization it would be useful, I think, to describe Peru's traditional educational system, within the context of Latin America. I will then go on to describe the Reformed System and its objectives, because what exists today is neither reformed nor traditional, but an educational system in tradition.

NOTES TO CHAPTER IV

¹La Reforma de la Educacion Peruana-Augusto Salazar Bondy, in Cuadernos del Consejo Nacional de la Universidad Peruana, September 1972.

²Reforma de la Educacion Peruana, Informe General, Lima 1974, p. 8.

³Ibid.

⁴Ibid., p. 36.

⁵Informe General; p. 37.

⁶El Comercio, Lima. 17/10/75, p. 4.

⁷Jan Tinbergen, Development Planning, p. 26.

⁸Hetzler, Applied Measures for Promoting Technological Growth, pp. 98.99.

⁹Prof. Eduardo Neale-Silva, quoted in The Pensadores of Latin America, by William Stokes, 1968, p. 422, in Intellectuals in Various Countries.

¹⁰Stokes, The Pensadores of Latin America, p. 427.

¹¹Ibid., Stokes quotes Carlos Octavio Bunge, José Ingenios, Manuel González Prado, Juan Agustín García and 'many others'.

¹²7 Ensayos de Interpretación de la Realidad Peruana, p. 107, José Carlos Mariátegui.

¹³Ibid., p. 109.

¹⁴Ibid., p. 109, 110.

¹⁵Ibid., p. 111.

¹⁶Selection of managers (directivos) generally does not follow professional or technical qualification criteria in evaluation, but rather proceeds by personal connection. Recursos Científicos y Técnicos, Sector Productivo, study by Consejo Nacional de Investigación, Lima 1974, Conclusiones 6.

¹⁷Informe General - Reforma de la Educacion Peruana, p. 13.

¹⁸ José Carlos Mariátegui, 7 Ensayos de Interpretación de la Realidad Peruana, p. 107.

¹⁹ Informe General, p. 25.

²⁰ Ibid., p. 44.

²¹ University students perform "prácticas profesionales", work in industry related to their academic studies. They are asked to submit a report of this "practice" to their university. Some universities require this practical experience before conferring a degree in industry-oriented professions. Most do not.

²² La Prensa, Lima, 18/10/75. The vice president of Southern Peru Corporation, Daniel Rodríguez Hoyle stated that more than one quarter of all the workers in the mining industry were qualifying (capacitándose) themselves in 1975 and that this would increase in future. Presently in training were 550 professionals, 2,000 middle management (mando medio), and 13,200 workers, in programs of the enterprises, in specialized centres in Peru and abroad. New professional training centres (for the mining sector) will be ready next year (1976) in Juliaca, La Oroya and Cerro de Pasco.

El Comercio, Lima, 14/10/75. Chrysler Peru S.A. trained line supervisors, general supervisors, and superintendents in programs developed by SENATI in coordination with the firm including courses for middle management to satisfy specific internal needs.

La Prensa, Lima, 7/10/75. Within the proposal to effect the permanent training of the Peruvian worker ENAFERPERU, the state railway corporation, in conjunction with SENATI has initiated a 28 million soles project, including equipment, to upgrade workers in workshop mathematics, and basic science, and 300 apprentices and service personnel in diesel electric and air brakes, and to send Peruvian instructors to Austrian training centres to improve technical teaching in the railway sector.

²³ SENATI is an industry-supported skilled labour training school system. It is extremely well equipped and staffed by international technical experts working with Peruvian counterparts. C.P.E. give short term, less than 1 year courses to upgrade skills in workers and apprentices in industry, and artisans. The goals are to retrain and recuperate obsolete tradesmen and the unemployed. The programs take place wherever most suitable and are essentially non-formal.

²⁴ La Prensa, Lima, 23/11/75. CENTROMIN (Empresa Minera del Centro) is carrying out a gigantic de-schooled program in Educación Básica Laboral (EBL) for workers and their families in 55 coeducational centres where 14,561 students are being taught. The project utilizes 448 professors and expenditures will total 110 million soles.

24 (Cont'd.)

La Prensa, Lima, 30/9/75. PESCAPERU, the state fisheries enterprise, will spend 16 million soles to pay teachers' salaries and purchase teaching materials to provide EBL for 26,000 workers within the sector.

La Prensa, 9/10/75. Close to 1,000 directors of Comunidades Industriales (Industrial Communities, workers management committees) will follow courses: Economic Accountant Technician; Organization, Administration and Control of Industrial Communities; mathematics, economics, accounting, Ideological Guidelines: Ideological Bases of the Present Revolutionary Process, for a Socialistic, Liberal and Christian Society.

25. "Peru's military men are of a distinct breed. Drawn largely from the lower and middle classes, they have travelled sufficiently both within and outside Peru to know the appalling conditions of poverty in their nation... But probably the main root of their thinking is the Centro de Altos Estudios Militares (CAEM), Peru's War college whose faculty includes some of the nation's most radical professors. The school offers a broad curriculum that goes far beyond classical military subjects, drawing on the concept that the national security must spring from social justice as well as military power." (Latin America, 10, 28, 70.) Admittedly political pragmatism has an input into the RGAF's progressive policies as well as altruism. Deadline Data on World Affairs. Greenwich, Conn. 06830 - Peru General Data.

CHAPTER V

STATUS OF EDUCATION IN PERU WITHIN THE LATIN AMERICAN CONTEXT

Before starting an analysis of the Educational Reform in its function of assisting in the provision of the necessary HQHR for indigenous industrial development and relative technological independence, a description of education in Latin America in general and Peru in particular is called for, to illustrate the problems of the traditional education system are not peculiar to Peru. (See Annex II for comparison of the traditional and the Reformed education systems.)

There are several generalizations that can be made about education in Latin America: educational development varies greatly in the region; with few country exceptions there are substantial numbers who have not completed the primary cycle, including many who are illiterate; urban areas have been most favoured in the distribution of educational services by a wide margin; and there is a surprisingly high participation rate at the secondary and post secondary level, higher than most countries in Europe for certain age groups.¹

To demonstrate the variance in educational development in the region we need only compare the participation rates in the three main cycles in the most and least developed countries, educationally speaking. In terms of enrolment as a percentage of the population aged 7-13 in primary level the participation rate ranges from 31% in Haiti to 103% in Cuba. In secondary, from 4% in Haiti to 56% in Uruguay. And in higher education, from .3% in Haiti to 16% in Argentina.²

Peru ranked 11th in Latin America in enrolment rate in the primary level with 84.6%, and 7th in the secondary level with 33%, and 5th at the higher level with an 8% enrolment from the eligible age group.³

The trend is to better coverage of the relevant age groups throughout Latin America during the decade of the sixties. Peru's performance is indicative of the progress in the region. Primary enrollment is up 62% over the decade while secondary participation has increased by 184% and higher education is up 203%.⁴

Peru's performance in increasing the participation rate in the primary sector of education is just about average for the region, but is encouraging in that enrollment has exceeded the population growth for the period, with a subsequent reduction in the illiteracy rate from a level of 38.9% in 1961 to 28% in 1971.⁵

The most common problem in primary education in Latin America is the uneven distribution of educational opportunities in that it is less available to the children in the rural areas. In addition the quality of teaching is not as good in the rural areas of Peru for example, because most of the primary school teachers have not had any formal teacher training. Only 32.9% had teacher training, and of these 92.2% were in urban areas.⁶ The children who do enter the primary level in many cases start late and leave early. Many rural children enter the system late and attend irregularly due to the need to assist their families in seasons of high agricultural activity, or due to the need to commence full time work at a young age; illness, change of address, family problems etc. It is estimated that only about half of the eligible children finish primary education in Latin America.⁷ There is also a high level of repeaters. Pupils may spend six years completing two or three grades.⁸ This of course distorts the statistics, but more important, many of these non-achievers are candidates for slipping back into the ranks of the illiterate.

The most striking feature of Latin American educational statistics is that in the 1960's the middle level of education grew faster than primary in most Latin American countries, in some cases four times as fast.⁹ The participation rate of relevant age groups exceeds that of most countries in Europe today, and is certainly much higher than European participation rates in the period when they had already attained universal primary education, which Latin America is far from achieving at present.¹⁰

Thus we have a clear demonstration that we cannot expect education to develop in the same manner in Latin America as in Europe, and therefore should avoid trying to apply European methods and systems to all education in Latin America, (something I am sure Mariátegui would agree with). This type of imitation has benefitted the privileged few who were initially favoured economically or geographically. The expansion of the secondary level has continued to be mainly in preparation for university entrance and the curricula dominated by the liberal arts and humanities. I am aware of the generalist-specialist argument in educational planning and agree that in certain contexts there is merit in the argument for late specialization. However, due to the historical dominance of education in Latin America by the liberal arts and the humanities, I think that to break this trend it will be necessary to emphasize the technical-vocational content in the curriculum, at least in the short run. To illustrate this need I would like to quote an excerpt from ECOSOC's assessment of the situation in Latin America, which agrees with my observations in Peru.

"The share of general (non-vocational) education in most Latin American countries has always been very important and this has been regarded as a dysfunctional factor for development since it implies a lack of

technical personnel at an intermediate level."¹¹ The report continues "It is, however, interesting to note that those countries which made secondary technical education a doorway to higher education, and which took steps to establish technical education at the university level, notably Argentina and Chile - succeeded in increasing secondary enrollment substantially, and in improving the capabilities of those students in the secondary system".¹²

While I realize that the example of Japan's development cannot be emulated in all respects due to historical and cultural uniqueness I feel that it is useful nevertheless to extract whatever aspects of her "miraculous growth of the economy since the war" which might be applicable in other contexts. R.P. Dore, an expert on Japan with an interest in Latin America, cites the singling out "as causal factors the stress on technological education which Japan shares with all other fast growing countries of the twentieth century, and the emphasis since the beginning of the modern period on popular education in rural areas - a feature shared with Denmark, the only other country to have succeeded in the last hundred years in pulling herself out of the same constellation of problems: backwardness, over-population and poverty of natural resources."¹³

Dr. Meilach Burstein, Director of Academic Improvement Program at the University of San Marcos, Peru's largest university stated recently: "There are examples in diverse parts of the world where underdevelopment, as has been possible to prove, is not directly related to economic error, but rather to lack of technology. The so-called "German miracle" just as the "Japanese flourishing", are due to the high technology these peoples possess."¹⁴

Peru is concerned about the irrelevance of her traditional education

system for social and economic development. Consequently one of the most important responses to this situation has been the creation of the ESEPs. (Escuela Superior de Educación Profesional) The ESEPs are the new upper secondary level of education which will replace the fourth and fifth years of the present secondary level and the first year of university. When they become generalized the ESEPs will put an end to the traditional separation of practical and academic courses. Although fifty percent, approximately, of the work will be devoted to academic courses there will be no purely academic or practical streams as such.¹⁵ This polyvalent approach to upper secondary education is designed to assure the utility of the graduate for national development and change, "so that he can assume the role of the principal agent for development and structural change in the country".¹⁶

The ESEP is considered the key to the Educational Reform. Its function will be to ensure that traditional dysfunctional attitudes toward practical work disappear and that an adequate supply of technicians and middle management is created to fill the gap that is now believed to exist. The ESEPs, once generalized, will be the only route to the second cycle of higher education, the university. It is expected that the ESEP graduate will influence the "autonomous" university with his demand for more relevant preparation for national development.

The ESEP program is designed principally, however, to produce Professional Bachelors (Bachilleres Profesionales) to enter the labour market immediately upon graduation. Promotion will be based on credits, allowing a premature graduate to receive limited certification in his specialty. The ESEP program will also be offered in a de-schooled modality for working adults and those in decentralized locations. However, this format is still under study.¹⁷

I think that a comparison of the old educational system (still existing in many phases at all levels up to the present) and the reformed (partly implemented) would prove useful at this point (see Annex IIB and IIC). Prior to the passage of Decreto Ley No. 19326, Ley General de Educación, in March 1972 the educational system consisted of six years of primary followed by five years of secondary, the secondary being split into two streams, general and technical. Higher education is covered by an intermediate stage of Academías de Preparación, (which prepares secondary graduates for university), Politécnicos superiores, (intermediate technical schools), teacher training colleges, and university.

The educational system after reform is completely implemented will consist of two streams of basic education, Básica Regular (formal) and Básica Laboral (non-formal) which will encompass the old primary (6 grades) and lower secondary (3 grades) cycles. Básica Regular will have two levels, the first level is Educación Inicial or pre-primary (sometimes called transición). Its main objective is to counter-balance the negative influences of adverse economic, social, cultural and nutritional conditions in the early stages of the childrens' development and to assist families in bringing up their children. This level is scheduled to be amplified greatly as it only covered 10% of the five year age group in 1970.¹⁸

The second level of Básica is offered in two streams, Educación Básica Regular (EBR) for the normal progression of continuing day students in the formal system. EBR has three cycles, grades 1-4, 5-6, and 7-9 and is free and obligatory for all children between 6 and 15 years of age.

Educación Básica Laboral (EBL) is a non-formal, open educational program for students 15-39 years of age, mostly school leavers and working

adults. It is aimed at eradicating illiteracy, qualifying workers at the semi-skilled and skilled levels for the labour market, and preparing the student who cannot attend the regular educational system for entry into Educación Superior Profesional, if he wishes to continue. It will be flexible as to duration and content in accord with the student's progress and the needs of the sector or region.¹⁹

From the Básica level, EBR or EBL, the student can continue to Educación Superior Profesional in the ESEPs or can continue to supplement his vocational training in CECAPES or SENATI. Briefly, the CECAPES are designed for the training of skilled and semi-skilled workers to keep up with the changing labour market (professional reconversion). These courses are given in Centros De Calificación Profesional Extraordinaria or in the firms where the workers are employed. SENATI also gives vocational training but not directed to further academic studies, but immediate incorporation in the labour force. It is located in a fixed location and is industry supported.

The major change in the educational system, however, is in the upper secondary level. The creation of the ESEPs is the key to reshaping the educational system to produce the necessary high and middle level manpower for indigenous development of the Peruvian economy. The ESEPs will be open to all Básica graduates from either EBR or EBL, which incidentally theoretically permit the movement of students between the two streams according to their needs and abilities.²⁰

The ESEPs will replace the old upper secondary, fourth and fifth years, and first year of university, and will become when generalized the only avenue of approach to the university. This is critical to the Reform

because the universities will continue to be outside the jurisdiction of the MOE after the Reform, responsible only to CONUP (Consejo Nacional de la Universidad Peruana). Sheltered by their autonomy the universities have demonstrated that they are actually dysfunctional for economic development in Peru and other parts of Latin America because of their bias toward 'the innate superiority of the generalist dilettante arts graduate'.²¹ The ESEP will be the key actor in achieving the economic development goals of the Reform not only in providing the middle management lacking at the present time, but also because it will hopefully shape the demand for more relevant curricula at the university level. This is because of the new emphasis on practically oriented curricula at the pre-university level. ESEP graduates, with their practical orientation, should create a greater demand for university specialities and curricula that will make the second cycle of higher education more functional for the country's economic development.

The university has been suffering growing pains in Peru partly as a result of the population growth, but also as a result of the increasing competition for employment and expectations of better remuneration to university graduates. Jan Versluis in his study for the International Labour Organization found that both secondary graduates and university students expected university graduates to earn two to three times the salary of secondary graduates. This led to an expectation of continuation to university on the part of 89% of the secondary students interviewed. The overwhelming preference for white collar work also causes even industrial arts students to aspire to university education along with all graduates of high school, whether in the letters, science or commercial stream.²²

This increasing demand for university education has created a

proliferation of universities from 9 to 33 within fifteen years with an explosive growth in student population from 30,000 to 180,000 (1975) within the same period.²³ And this tremendous growth in number of institutions has not begun to cope with the demand. Every year has seen an increase in the number of applicants with a smaller percentage of those being accepted. This has led to a situation where 67% of all university entrants have had to write the university entrance exams in more than one year,²⁴ and only 33.8% of the 111,729 applicants to university in Peru in 1974 succeeded in gaining entrance.²⁵

Geographically the urban areas have been favoured. Lima in particular has benefitted having fourteen of the thirty three universities. It is interesting to note that the private-sector participation has been increasing continuously, if slowly, in all areas of study.

In order of importance the areas of study have been as follows: humanities, education, engineering and architecture, medicine and sciences.²⁶ But recently engineering has taken over the lead by a wide margin, followed by education, economics, accountancy, law, medicine, and administration sciences, with psychology and agronomy trailing but still ahead of architecture.²⁷

This new importance in number of engineering student enrollment would normally augur well for the economic development of a country, but it will depend very much on the intentions of the engineering graduates of the future how useful this increase in numbers of this discipline will actually be. This cautious evaluation of the pure numerical increase is born of the historical underutilization, or even non-utilization, of engineering training in Peru. Not all or even a majority of engineers follow engineering studies with the intention of practising the profession. In fact it is said that

only 30% of engineers actually practise their profession.²⁸ Whether this is due to lack of openings to practise the profession or due to the utility of the title to obtain management or other positions of importance and good remuneration is only important in that the thirty percent is not sufficient for indigenous economic development or represents a serious misallocation of scarce resources. I mention it in detail at this point only to illustrate the misleading character of education or manpower statistics in this context. The important factor is the quality and the utilization of the highly qualified human resources produced by the educational system. It is obvious that the social and economic system has been rewarding university graduates of all disciplines out of proportion to their economic utility. Ways must be found to improve the rewards to middle management and technicians both in economic terms and in terms of social status. Otherwise the ESEPs will not live up to expectations. The majority of its graduates will wish to continue on to university unless adequate social and economic rewards are forthcoming to Bachilleres Profesionales. Unless its graduates go directly to the labor market the ESEP will have failed to produce the badly needed technicians and to reduce the excessive demand on universities.

We will now move on to a thematic treatment of the issues and problems in the supply and utilization of this key factor for indigenous economic development and relative technological independence.

NOTES TO CHAPTER V

¹In the seventeen year group. E/CN.12/924, p. 35. SECONDARY EDUCATION, SOCIAL STRUCTURE AND DEVELOPMENT IN LATIN AMERICA. November 25, 1971. ECOSOC.

²E/CN.12/947, table 7, p. 42, UNESCO and ECLA, 5/2/73, and -/3/73.

³Ibid.

⁴Ibid.

⁵E/CN.12/924, p. 4, table 1.

⁶Human Resources, Education and Economic Development in Peru, QECD. Paris, 1967, p. 89.

⁷E/CN.12/924, p. 1.

⁸Ibid., p. 27.

⁹E/CN.12/947, p. 46.

¹⁰Ibid., p. 47.

¹¹E/CN.12/924, p. 52.

¹²Ibid., p. 55.

¹³Education in Japan's Growth, R.P. Dore, London School of Economics, Jan. 1964., in Pacific Affairs, Notes and Comments.

¹⁴El Comercio, Lima, 15/10/75.

¹⁵Reforma de la Educación Peruana-Informe General, p. 67.

¹⁶Ibid., p. 63.

¹⁷Interview with Srta. Rosa Takonaga 11/12/75.

¹⁸IBRD1, Oct. 30, 1973.

- ¹⁹Informe General, pp. 83-93.
- ²⁰IBRD2, p. 8
- ²¹Thomas Balogh, Education Must Come Down to Earth, CERES.
- ²²High Level Manpower for Peru, William Foote Whyte and Graciela Flores, in Manpower and Education, Harbison, Meyers.
- ²³Problemáticas Universitarias I, Lineamientos para un Plan de Acción, Mario Samamé Boggio, ex-president of CONUP, La Prensa, 6/12/75.
- ²⁴Perceived Difficulty of Finding Work After Completing Secondary or University Education, Jan Versluis, Working Paper No. 2, World Employment Program Research, I.L.O. Geneva.
- ²⁵Amadee Julian A., La Prensa, Lima, 17/11/75, and Wilson Benites D., Ibid., 23/10/75.
- ²⁶EFM44, Vol. II, p. 3.
- ²⁷Boletín Estadístico No. 7, Cuadro No. 61, CONUP.
- ²⁸Informe Sobre la Escuela de Tecnología de la Universidad Nacional de Ingeniería (now known as ENIT - Escuela Nacional de Ingeniería Técnica) Informe DeCora, Jan. 71. By examining the members of the Colegio de Ingenieros and comparing their statistics with the number of graduates from university engineering courses it has been established that only about 50% of the engineering graduates are officially registered to practise. Furthermore, of this group registered to practise only 60% exercise engineering functions. This means that only 30% actually practise what they were prepared at considerable cost to the country to do.

CHAPTER VI

SCIENCE TEACHING

Before launching into a detailed examination of the three or four areas that appear to be critical to the provision of adequately qualified manpower that Peru needs for indigenous industrialization and technology development let me review these areas briefly.

In general terms, there are the problems that seem to be solvable in terms of the Educational Reform. These are an excessive intellectualism, the general lack of enthusiasm for technology, the low status of manual labour and practical occupations.

More particularly, this translates into a traditional education policy that has led to a shortage of qualified technical teachers, archaic teaching methods, especially in natural sciences, memorization instead of analysis and practise, lack of equipment and complementary materials, texts and resource books, and lack of industrial research programs and institutes.

General solutions embodied in the Educational Reform are to promote a widespread positive attitude toward science, technology and technicians, and to discourage the snobbery of professions, to encourage analytical methods of study, especially in natural sciences, and stimulate creative experimentation in the practical application of basic knowledge.

In particular this means: (i) retraining teachers to motivate and qualify them to implement the goals of the Educational Reform, (ii) improve science teaching and link it to practical applications in vocational and professional training, (iii) supply the appropriate equipment, machinery, laboratories, including complementary materials and books, (iv) create the research and development institutes for the development of researchers and

industrial technology.

I propose to deal first with the question of science teaching as it is critical to the later training of scientists, engineers and technicians that an interest in science be awakened in the young student and good learning practises be instilled early in his educational career.

In Latin America up to World War II most countries were largely exporters of raw materials and importers of manufactured products. This situation put few demands on the educational system to provide scientists and technologists to develop a national technology. Therefore, science and technology were ignored in the educational system to a large degree, or were out of tune with the reality of countries such as Peru.

Marcelo Alonso, deputy director Department of Scientific Affairs, O.A.S., feels very strongly that the resultant "weakness of the scientific and technological infrastructure is one of the greatest limiting factors hindering the acceleration of Latin American development".¹

Today, enlightened and progressive governments such as Peru's, recognizing the importance of technological independence, have moved to rectify the weakness in science teaching. This weakness is described in a 1971 ECOSOC report as follows: "First of all, science still does not occupy a large place as regards teaching hours and, even more serious, there are many defects in the teaching of science, including those mentioned by UNESCO, such as antiquated curricula, lack of unifying concepts, presentation of science as an immutable set of truths, lack of practical activity, a critical shortage of teaching staff, both in quantity and quality, lack of equipment and teaching materials, etc. Secondly, most of the general education curricula do not include any technological training and hence the teaching

of science is not linked to the modification of productive processes but is confined to the purely intellectual plane."²

The Revolutionary Government of the Armed Forces recognized early in its tenure of office the importance of improving the educational system. As a result the RGAF appointed the Education Reform Commission in November 1969. The Commission in its General Report (Reforma de la Educación Peruana, Informe General, 1970) recognized the "fundamental role of science and technology within the present concept of education understood in its intimate ties with development".³

In its concluding statement on the subject the Commission states that "...it is necessary that scientific and technological education cover all levels of national education, from elementary grades, embryo of an investigative and creative spirit, to the highest cycles of study where most original contributions to human knowledge are produced. It should reach, furthermore, all sectors of the Peruvian population, making possible a real revolution in concepts and methods. The State should, finally, reorientate, stimulate and adequately equip scientific research and technological programs of all types and at all levels, as an integral development policy demands."⁴

Within these general guidelines there has been a rebirth of a science teaching improvement program through the establishment of a permanent mechanism to rectify the shortcomings in this area. As a result there began a move away from rote, repetition and regurgitation without analysis toward problem solving and application of theory to practical purposes. The permanent organism created to execute this task of upgrading science teaching in Peru is PRONAMEC (Programa Nacional para el Mejoramiento de la Enseñanza de las Ciencias) established in June 1971. PRONAMEC had its roots

in CENAMEC (Centro Nacional para el Mejoramiento de la Enseñanza de las Ciencias) the national centre created for the same purposes after an agreement was signed with UNICEF and UNESCO in January 1970.

PRONAMEC is a program of the Ministry of Education (MOE), Dirección Superior, under the administration of INIDE (Instituto Nacional de Investigación y Desarrollo de la Educación "Augusto Salazar Bondy"). A ministerial resolution allocates the following tasks to PRONAMEC:⁵

1. Promote and realize the improvement (perfeccionamiento) of existing teachers in the fields of biology, physics, mathematics and chemistry teaching.
2. Contribute to the orientation of preparation in sciences in the training of future teachers, cooperating with the teacher training institutions.
3. Cooperate in research in new methods of basic science and mathematics teaching.
4. Cooperate in the development of activities in improving educational supervisors.
5. Design, construct and acquire equipment and materials for basic science and math teaching.
6. Make an inventory of the equipment for basic science and math teaching existent in the locations under the jurisdiction of the MOE.
7. Distribute basic equipment and materials for the teaching of science to state institutions under the condition that their best use will be assured.
8. Install and maintain in service Núcleos de Ciencias (Unidades) in the capitals of the Departments of the country and the districts that require them.

PRONAMEC operates out of headquarters in Lima and has at present 23 Science Units (Unidades) operating throughout the country.

Headquarters has a production centre for laboratory materials and for the actual laboratories for each of the specialties in basic science and mathematics. Headquarters personnel consists of a General Coordinator, four area coordinators (biology, physics, math, and chemistry) a teaching (didáctica) and programming coordinator, and a production coordinator. Also on staff are six professors (2 biology, 1 physics, 1 math, 1 chemistry, and 1 didáctica) plus administrative and support personnel.

The Science Units consist of six areas (3 laboratories: biology, physics and chemistry; a mathematics room, and a workshop) under the charge of four professors, area specialists, and a lab assistant.

PRONAMEC offers three types of courses.

Type I are summer courses for natural science and mathematics teachers which are given during summer vacation and last five weeks. These are held with the collaboration of five universities and can accommodate 600 teachers per year. These courses are given in two levels, initial and advanced.

Type II are specialization courses and last five months of full time attendance. They are directed toward the preparation of the specialists that will staff the Science Units. Teachers are paid their full salary while in attendance, plus living allowance for those coming from the interior of the country. Over one hundred of these specialists have been trained and most of them (87) are now working with the program. (annual capacity approx. 60)

Type III are given by the Science Units and are called Zonal Courses.

These are offered to teachers in the region where the unit is located.

Duration of the courses is 6 to 8 weeks, either part time during the school year or full time during the vacation period. (approx. 3000 teachers have benefitted from these courses so far)⁶

PRONAMEC participates in other short term educational activities such as supporting the zonal and regional teacher retraining program within the general Conversion Plan of the Educational Reform. They hold periodic seminars to evaluate progress in the improvement of science teaching (Feb. 1970, June 1973, April 1975).

Among the most interesting activities of PRONAMEC is the promotion of Science Fairs. These take place in the Science Units or at headquarters. Several of these took place during my stay in Lima and after visiting them I can vouch for the originality and resourcefulness of the students in the application of theoretical knowledge. These science fairs received substantial publicity in the newspapers which stimulates an interest among the general public and encourages the students through recognition of their efforts. These Science Fairs fall very much within the category of what President Echeverría of Mexico was calling for, the popularization of science and technology at the early stages of education and throughout the general public to increase the acceptance of this pre-requisite to the development of a scientific and technological infrastructure.⁷

In this vein the Minister of Education, Gen EP Ramón Miranda Ampuero opened a new Dynamic Museum of Sciences on December 4th, 1975 which displays the latest advances of science in terms that the average layman can comprehend, with the help of a team of six permanent professors. This type of exposure to science and technology

constitutes non-formal or extension education in this field, which is part of the duties ascribed to PRONAMEC.

PRONAMEC, beyond retraining and improving the quality of science teachers and popularizing science, is interested in sponsoring a change in the focus in curriculum planning in science teaching, and the design and development of prototype laboratory equipment which can be easily constructed, to overcome two of the most important shortcomings of science teaching in Peru.

In curriculum planning PRONAMEC is seeking to change the focus from one "centred in teaching independent matter with strong emphasis on memorization" to one that is "integrationist with emphasis on methodology that will permit the most efficient development of the student. That is, which will emphasize discovery and development of dormant abilities and skills in the student rather than exercise his capacity to memorize: that will teach him to reason and critically analyse situations and clearly define the problem in such a way that he can find the most reasonable solution, rather than supply him with stereotyped formulas to resolve problems unrelated to his daily life."⁸ If PRONAMEC succeeds in generalizing this progressive type of teaching and learning then I feel that Peru will have taken a major step toward opening the door to the possibility of creating an indigenous technology and national industry. Words will no longer have a value only unto themselves. They will be translated into creative thinking, the keystone for problem solving. This is the task, a monumental one, that someone had to take on to break the repetitive cycle of non-relevant and non-productive teaching and learning, especially in the area of basic knowledge for preparation of future scientists, engineers and technicians. If PRONAMEC can gain the

cooperation of the majority of the science teachers, can succeed in upgrading their qualifications, and finally, can assist them in making or obtaining the necessary equipment and materials to make useful science teaching viable, then it will have made a major contribution to the development of Peru through instilling positive attitudes to science and its practical application and developing problem solving skills in the students.

In view of the high cost of equipping existing schools with laboratory equipment and complementary materials, schools which at the present time are inadequately equipped to the point of rendering any serious effort at science teaching ineffective, PRONAMEC's responsibilities and actions in this area are almost as critical to the success of the reform of science teaching as teacher upgrading and curriculum improvement. Through the design and production of prototype equipment it will be much more a possibility to extend the availability of properly equipped laboratories to all school zones.

PRONAMEC's responsibilities in this task are the installation, complementation, use and maintenance of Basic Science Laboratories acquired through international agreements and credits. This is a complicated and demanding task. It entails preparation of teaching personnel in the use of the equipment and responsibility for the maintenance of these laboratories, including maintaining workshops to repair and maintain the above. PRONAMEC also is in charge of completing with national parts and fabrication whatever complementary equipment can be devised. To date they have produced twenty prototypes including an air table, low cost microscopes and wave machines. Expectations are to produce sixty new prototypes including equipment and

work instruments in the coming year. The hope is to expand the production of parts and accessory equipment for existing labs and to supply those institutions that as yet do not have labs with low cost materials and equipment.

The production of equipment and materials will be not only for formal schooling but for non-formal modalities as well. It is intended to build and operate Mobile Science Units to reach low density population areas, in keeping with major precepts of the Educational Reform designed to extend education to all sectors of the population.

I shall mention PRONAMEC's role in the installation, complementation, use and maintenance of laboratories acquired through the Peru-Hungary Credit agreement only briefly here to illustrate the difficulties involved in the upgrading of science teaching. One Science Unit had distributed a total of twenty-four laboratory units, seventeen 'mini' units and seven 'basic' units which are substantially larger. The majority of these laboratory units are reported functioning. Ten units are apparently not functioning, three basic and seven mini, due to lack of available area suitable for their installation, and/or the need to install electrical and gas outlets. This part of the responsibility to install laboratories lies with the Dirección de Coordinación de Créditos Educativos (DICOSE) as we shall see in the following chapter dealing specifically with equipment in all levels of the educational system. The point that I am trying to get across here is that it appears to me that it is not altogether PRONAMEC's fault that they have not been able to complete this task satisfactorily.

In fact my impression of the personnel that I met, from the Director of INIDE (Instituto Nacional de Investigación y Desarrollo de la Educación) right down to the area specialists in the Science Units, is that they appear

to be well informed as to their role, capable and dedicated to the goal of improvement of science teaching. These specialists who conduct the zone retraining courses are able to assess the degree to which this training is utilized in the classroom. Teachers who have participated in the courses demonstrate their continuing interest by their consultation, or lack of it, with the Science Units. The Units, through their function of dispensing reagents for laboratory experiments can pretty well tell which professors are conducting fruitful science classes and which have reverted to blackboard teaching and require further assistance to achieve good science teaching practise.¹⁰ It is estimated that approximately ten per cent are working well, teaching according to their PRONAMEC training. Unfortunately the good efforts of even this small percentage that succeed in upgrading science teaching are met with resistance on the part of the parents. They believe that their children are not advancing as fast as the children in classes of traditional blackboard teachers. This indicates the need to publicize and explain to the general public the value of the new methods of teaching science to the student both in his future academic studies and in his work career.

The Science Fairs sponsored by PRONAMEC are a step in the right direction. I had the opportunity to visit one of the several that took place in Lima and Callao. I must admit I was agreeably surprised by the variety and ingenuity of work displayed by the students who constructed everything from electrical apparatus like novel film projectors or a demonstration of electrolysis to the mock-up of petroleum drilling operations and conversion of cellulose filter paper to sugar. The idea is to reach the members of the community in a simple and direct manner to interest them and the educational

authorities in the process of teaching and learning. More than ten thousand students from nine educational centres in Callao alone, participated in the Science Fair. All of the works were created by the students themselves, and there were quite a few. There were more than three thousand works created by the students of fifth year of secondary in another zone, Miraflores, eighty percent of which were judged creative.

"These fairs do not pretend to display sophisticated activities", said the directress of the Callao Science Unit, "only how much the teachers have been able to generate in their students, through work developed in the classroom, an awakening in them of an interest in research and in the creation of activities."¹¹

And what a step forward that is from the 'dictation'* of classes in the traditional methodology.

The PRONAMEC program is one of the most useful, needed, and straight-to-the-point efforts to rectify the inappropriate teaching methods and curricula of the past, in an area of preparation of human resources vital to science, technology and industry.

Before closing this chapter I would also like to point out that a team in the Dirección de Educación Superior, M.O.E. is also making good progress in setting up an improved science teaching program for the ESEPs. A good text has been prepared which involves the student in simple but creative learning processes. Now the task is to obtain enough qualified *dictar is the verb; to dictate, to deliver a lecture, a very descriptive verb for traditional teaching methods.

science teachers and laboratory equipment to make the new curriculum workable.

NOTES TO CHAPTER VI

¹Marcelo Alonso, Science and Education in Developing States, Rehovot Conference 1969, Philip and Hadasah Gillon, Praeger 1971, p. 54.

²E/CN.12/924, p. 56.

³Reforma de la Educación Peruana, Informe General, p. 23.

⁴Ibid., p. 25.

⁵PRONAMEC: a revised and updated version of a presentation by Prof. C.A. Quiroz to a meeting on The Improvement of Science Teaching, Venezuela, Dec. 1974, published by the Program to explain its activities.

⁶Professor Raúl Pardo Boza, General Coordinator PRONAMEC.

⁷Excelsior, Mexico City, 24/8/75.

⁸PRONAMEC, p. 12. As an example of the weakness in the present system that PRONAMEC is referring to I cite the comment from the report of a technical advisor on this subject: "The majority of the students (at the higher politécnico José Pardo) cannot solve problems of a type that has not been amply explained by the professor and appeared to be very frightened when they have to solve a new type of problem. Many students have problems reading instructions to perform experiments, and to formulate answers in the substantiation of the test (prueba), probably due to a lack of practise throughout the large part of their training." A.W.G.M. Fransen, Dutch Expert in electronics, Observaciones y Notas Críticas, October 10, 1973.

⁹Observaciones y Notas Críticas, A. Fransen, Dutch Electronics Expert and former professor at Instituto Tecnológico Nacional José Pardo, Lima, Oct. 1973.

¹⁰Interview with area specialist in Science Unit, 26/11/75.

¹¹La Crónica, Lima, 30/11/75.

CHAPTER VII

LACK OF EQUIPMENT, MATERIALS, MAINTENANCE

This chapter examines in detail the lack of text books, reference books, equipment and complementary materials, and buildings to house these, not in a spirit of negative criticism of a well known phenomenon, but because in the examination of the problem several partial solutions present themselves. Furthermore, if the problem is not resolved satisfactorily I doubt whether the Reform will be successful in its goal of making education more relevant for economic development than it has been in the past. The vocational content of the curricula at all levels will remain as theoretical as ever, blackboard teaching will persist, and negative attitudes to practical work will remain unchanged.

I propose to deal with technical education at five different levels of the educational system. The comments are taken from personal interviews with the recent graduates of each level unless otherwise indicated.

Starting, then, with secondary education, the general statement about science teaching in Latin America is that it has many defects, among which the lack of equipment and teaching materials is high on the list. ECOSOC's report on secondary education in Latin America states in its conclusions: "Lastly, the teaching of science does not include practical work or experiments to link science to technology and its applications to actual materials. What are termed practical classes in many education systems operate at more or less the hobby level or are closer to an artisan-type conception of work than to giving practical form to scientific and technological principles. This gives rise to situations in which schools

teach theoretical physics and chemistry, but have facilities for practical work which are poor copies of carpenter's workshops, for example."¹

This type of situation develops or remains in face of lack of adequate equipment and materials no matter how well-intentioned the curricula may be or how well prepared the teachers are. Therefore the situation I am about to describe must be rectified if Peru wants indigenous industrialization and relative technological independence.

The situation regarding equipment in technical secondary schools in Peru is as follows according to recent graduates of these schools. The men's technical school in Callao (Escuela Técnica de Varones del Callao) has enough equipment, but it is quite old, being of 1940 vintage. Here I think it is as well to clear up the difference between age and obsolescence. If similar equipment is still being used in industry due to relatively static technology in the particular field then the graduate trained on similar equipment, regardless of its age, is probably better adapted to the needs of local industry than someone trained on irrelevant equipment, modern or not. There have been some comments that SENATI graduates are spoiled, having worked with the very latest equipment, and need to be retrained when they are confronted with fifteen to twenty year old equipment in industry.²

The Escuela Técnica de Varones del Callao did have new Hungarian equipment but lacked funds to construct a new workshop in which to locate it. It was also stated that pupils had to supply their own workshop materials as there was no budget for same. A technical teacher with experience in several institutions stated that other state secondary schools have little equipment, tools or materials to practise. Mentioned were Mariano Melgar and Melitón Carvajal.

At the higher polytechnical level comments were as follows: Instituto Tecnológico Nacional "José Pardo": (Mechanics 1973)³. Good equipment in mechanical workshops, good laboratories; (75 graduate) Hungarian equipment installed very recently, as a result there was no waiting to practise or make experiments. (Electronics ('73) felt José Pardo had best electronics lab in the country, but that they lacked budget to keep it up to date. In spite of this others complained of too many students for equipment available. (Mechanical 1974) Indicated that students were handicapped by small number of texts available in Spanish, by lack of materials to practise i.e. dismantling and assembling electrical motors or pumps, had to secure these outside. As mentioned earlier they were able to install the Hungarian laboratory equipment, being fortunate enough to have sufficient electrical current, (three phase) lack of which presented problems in other institutions. However, the majority of the Hungarian equipment did not have pamphlets or books for installation, and/or instructions for use, which unnecessarily delayed installation and limited utilization.

A problem symptomatic of many institutions, but rather surprising in one that many consider to be the best polytechnic in Peru, is the low level of maintenance of equipment, many pieces of equipment were reported not functioning due to lack of parts. Requests for parts and the assistance of Hungarian experts were made to the MOE, apparently with unsatisfactory results. These last comments came from a former teacher in "José Pardo" now in industry so that I do not think they can be taken lightly.

There seems to be a lack of appreciation at the MOE of the importance of maintenance.⁴ Unless this situation is rectified it will result in a deteriorating situation for the students of technical and vocational education

2 2

OF/DE

because the amount of practise will be gradually reduced as the number of machines and equipment functioning diminishes due to unrepaired breakdowns. This, of course, is not the worst of it. This approach to maintenance sets the tone, it creates a careless attitude to maintenance in the student that carries over to industry, where uncorrected it can prove much more costly. If there is any level at which the educational system should be trying to instill proper attitudes toward something as important as maintenance it is certainly at the higher politechnical level which is supposedly turning out 'mando medio' (middle level management) or technicians whose responsibility it will be to ensure good maintenance practise in industry.

This is the situation at the best polytechnic in Peru. At the Politécnico Nacional Feminino del Callao the situation as far as buildings, fixtures and equipment are concerned is incredibly bad. If it were not for a dedicated faculty and an interested, although impoverished community, it would be hopeless. The buildings are relatively new, but barren and unfinished. The desks are old, teaching materials scarce to non-existent. For example, the students in Corte y Confección, (dressmaking and sewing) must buy their own materials and work on antique sewing machines. The work benches in one classroom were made from the packing cases of the famous Hungarian equipment, much of which was still in the yard in cases of course. But the teachers were making the best of a very difficult situation and were, I believe, truly improving the capabilities of the mothers and daughters of Callao either to obtain employment or to improve the quality of their lives. The creative work being taught to teenagers with little more than silver paper and molds of leaves and flowers to make decorative mirrors is testimony to the resourcefulness of a determined and dedicated group of teachers.

However, if these teachers working under extremely difficult conditions, almost forgotten in the MOE budget, working in their own words "as teachers of the second category", are susceptible to the blandishments of the radical union leaders who suggest that conditions could hardly be worse, who could blame them. My point is that proper equipment is crucial to teacher and student morale, as well as indispensable for real technical and vocational education.⁵

At the technical engineering level the Escuela Nacional de Ingeniería Técnica (ENIT) was established under a slightly different name in May 1964, to bridge the gap between engineers and technicians, just as today the ESEPs are expected to remedy the still existant shortage of 'mando medio'.

ENIT was originally endowed by UNESCO assistance with the best existing machinery and equipment available at that time, but which has not been renewed since then. There are no funds available for either new buildings or for renovation of equipment, in spite of increasing demand for student places, and deteriorating machinery and increasing obsolescence, especially in a fast moving technology like electronics. ENIT's equipment attracted students from its then big brother institution Universidad Nacional de Ingeniería (UNI) with which it shared its facilities as well as with several other universities which did not and do not have workshops for practical application of theory. Some such as "La Católica" have since acquired superior equipment, others like Ricardo Palma, Universidad Técnica del Callao and San Luis Gonzaga still use ENIT 'talleres' (workshops). But now there are problems of breakdowns through lack of maintenance and lack of replacement parts, which is reducing what used to be a full range of equipment within

the specialities taught, and diminishing the opportunity to practise. For example, in 1969 students were required to do ten experiments in physics, twelve in chemistry, and twenty in technology per semester; in 1975 they do eight in physics, ten in chemistry, and only four in technology!

This situation has come about for several reasons. First, when UNI took over the supervision of their (ENIT's) budget they appropriated approximately one third of this budget for 'other' purposes. As a result of this 'saving' ENIT could not replace equipment that had deteriorated or was lost in the laboratories. The second story planned for expansion was not built in spite of increasing demand and machine maintenance was not achieved.⁶ As of January 1st, 1973, ENIT came under the responsibility of the MOE, whose budget for equipment, workshop materials and maintenance has already been demonstrated to be strikingly inadequate in our observations of the secondary technical and vocational education.

Even at the university level it is not an encouraging picture, with one or two notable exceptions. UNI, the traditional leader in the training of engineers considered most desirable by industry⁷ (along with those from La Católica more recently) suffers from the criticism of its recent graduates regarding equipment and study material. Complaints were: the shortage of resources in the library, few copies of each title (particularly critical where students cannot afford to buy texts) and lack of access to statistics. Lack of equipment, (mechanical eng. '73) working in groups of four means three quarters of the time in the workshop is spent waiting, and they practise only six hours per week in any case. (Electrical eng. '75) Lack of equipment, and some obsolete, lab materials scarce. (Mechanical Eng. '73) lack of equipment, mostly old and worn out, library is short of specialized books.

Five machines for the thermodynamics laboratory were unused in four or five years due to lack of funds at UNI to install them properly. These have been located in an unfinished pavillion during this time. I visited this pavillion and the workshops of Unidad No. 3 at UNI accompanied by the Jefe del Laboratorio Carlos Arguedas Rivera who explained that UNI had only recently received the funds necessary to enclose the upper part of the pavillion to keep out the ever-present dust that is typical of Lima's atmosphere. This was according to him the reason that these machines could not be installed and utilized previously. He also showed me around the rest of the laboratories and workshops in his section. My general comment would be that the students are correct. The equipment is old, with only 25% of it being relatively new, acquired under an IDB (Inter American Development Bank) loan in 1971. On the other hand the faculty and staff are doing a good job with what they have to work with, making replacement parts themselves, doing test work for industry, (testing cables, springs, heavy duty plastic valves, etc.). The machines are in use from eight a.m. to eight p.m., which is an indication of the need for additional equipment. I also noticed that the draughting room in the new pavillion was very unsuitable for this purpose. The lighting was very poor and the draughting boards were crammed together so that one had difficulty passing between them.

A visit to the campus and mechanical engineering workshops at 'La Católica' (Pontificia Universidad Católica del Perú) demonstrated what is possible given the necessary funds and their optimal utilization. The equipment was new and well maintained, set in spacious, well lighted buildings. The university, being a private one, was able to count on outside funding to amplify what it received from the state. Approximately fifty percent of the

operating funds came from private sources, and the land, construction and equipment funds were acquired with substantial non-governmental financial assistance.

At Universidad Nacional Mayor San Marcos (UNMSM) the largest university in Peru, the criticisms were: (Industrial Eng. '74) mechanical lab did not exist, had to go to UNI for practical work; the large demand for the use of the computer centre could not be satisfied, approximately half of those who wanted to utilize this facility got to do so, felt the lack of infrastructure prejudiced the training of the student. (Bus. Admin, '71) lack of books in library, especially modern ones, and lack of copying equipment. (Professor of metallurgy in UNMSM 1975) lack of equipment in labs forced the jefe de practicas to go to SIMAC (Servicio Industrial del la Marina-Callao) for demonstrations. Approximately one half of tests were done outside the University, at the facilities of FAP (Fuerzas Aerias Peruanas-Peruvian Air Force) or other facilities.

Universidad Federico Villareal, the second largest university in Peru; (Industrial Eng. '72) has no talleres (workshops) in the university, resource material scarce in the library (Bus. Admin, '71) lack of teaching material, need more resource materials.

Universidad Nacional Técnica del Callo; (Mech. Eng. '75 evenings 5pm -11pm) stated they lacked equipment, had an agreement with UNI and ENIT to do practical work, which while optimizing the use of scarce resources seems odd at a 'technical' university.

Universidad Nacional del Centro, Huancayo, ('69 Chemical Eng.) no budget for parts and materials, had to improvise parts. Eventually lead to demonstration not practise.

Universidad Nacional de Educación E.G.V. - La Cantuta. The only technical teacher training institution giving training in industrial specialities. (Lic. en Educación Técnica, electronica, '75) lacked equipment to equip the workshop, the Hungarian equipment on site since 1974, chemistry lab ready, physics lab not. Electronics equipment obsolete, (1958 vintage). Lack of equipment forced seventy students to practise in two shifts, thirty-five to a shift, three to an instrument. Integrated circuits were only a drawing, were not a reality, therefore no opportunity to practise this part. A second student in the same speciality, same year, stated that in a six hour practical session the individual obtained one half hour actual practise. It has also been stated that La Cantuta had not changed its equipment nor teacher training techniques since 1951.⁸

A personal visit to 'La Cantuta' (8/12/75) confirmed the semi-dilapidated state of affairs on this much politicized campus. In Mecánica de Producción workshops students stated that many instruments were missing, some machinery was without grease, and many windows were broken. The rest of the workshops were equally poorly equipped except Ebanistería (woodwork).

The ESEP, the key actor within the Educational Reform to produce better prepared graduates for the labour market, will utilize more expensive equipment than that of the corresponding traditional grades. The ESEP program has just been initiated in April 1975 and already it is having to adapt its curriculum programming, delaying the practical portion until equipment and qualified professors can be supplied. A visit to the ESEP of Lima and discussion with the director and assistant director indicate

that there are serious economic constraints to the installation and functioning of the laboratories and workshops. The budgetary shortages, in support personnel, only four supplied out of twenty-three budgeted, caused severe problems in maintenance of the premises. In fact I was told that it was only accomplished with the assistance of the faculty and students.

Notwithstanding the importance of the success of this first group of nine experimental ESEPs, (of which the ESEP de Lima is perhaps the most visible) this locale had a very unfinished look about it despite having been in operation for eight months at that time (28/11/75). The Hungarian machinery was still outside in its cases, the workshop area being used for a classroom, and the laboratory equipment was stored in a cupboard whose unglazed windows were covered with packing case tops. Classrooms were relatively bare of equipment save for desks and blackboards. Water and gas outlets in the laboratories were still sealed, indicating that lab equipment had never been connected. I was told that only simple instruments for biological dissection had been used of the total equipment supplied for laboratory use.

The general facilities were still relatively primitive, with no proper cafeteria, just a snack bar in operation. Sports facilities were just being organized. These will be rectified in time, I presume, but unless the equipment for labs and workshops is made operational soon (the practical content of the curriculum is scheduled to occupy a much greater proportion of the study hours in the third semester starting April 1976) I fear that science teaching in the ESEPs will not be as effective as it should be. The curriculum has been improved and a good textbook has been designed which encourages the student in the analysis of physical, chemical and biological

phenomena.⁹ The introduction points out that through simple experiments the student will learn to reason through observation and comparison of natural phenomena, will come to conclusions that will give the student a precise idea of scientific research. The student will also acquire manual dexterity in the handling of equipment.

Unfortunately the ESEPs are short of reference books and short of laboratory equipment to do the experiments. Thus for all the good intentions, the program, which appears to be a vast improvement over the traditional technical secondary program that it is replacing, will be delayed and the quality diluted by lack of equipment.¹⁰

Thus we have a situation in professional, technical and vocational education in Peru where the general rule is the lack of or obsolescence of machinery, equipment and complementary materials, library books and other resource materials. The exceptions, (which are better equipped) 'La Católica', 'José Pardo', SENATI., Colegio Salesiano, Jesus Obrero and ENIT, to a degree, are due to greater or lesser external (mostly private) financing. All have this in common, they have received foreign assistance in equipping their workshops and in training their teachers.

So that some way must be found to remedy the general situation to give the student access to sufficient equipment to round out his training. I feel that curriculum improvements, teacher retraining and extension of education to a greater proportion of the population, while effective for other purposes, are not sufficient to produce the quality of graduate that is suitable for industry. He will not have been exposed to useful practical training in the educational system. One can argue that this can, and perhaps should, be done at the industry level either during summer vacation periods

or in a period of apprenticeship upon entering the labour force. The response to the first that there are not nearly enough openings in industry to give more than a favoured few the opportunity for 'prácticas vacacionales', (summer employment in industry)¹¹. Secondly it would seem that apprenticeship is more suitable for skilled labour, and that engineers and para-professional technicians are not going to acquire the necessary understanding of practical application of theoretical knowledge solely in industry. This can only be obtained through an interplay of theory and practise with both inputs present. This means study under knowledgeable teachers in a milieu that offers sufficient equipment to put theory to practise.

What can be done to improve the situation? One useful suggestion that has been put forward and is presently the subject of a feasibility study by USAID is the initiation of centralized education services such as laboratories, workshops and libraries which would be available to a number of educational institutions within an educational "núcleo" (local administration unit)¹². Another suggestion by a Dutch technical education expert is to establish mobile maintenance units to visit all centres utilizing machinery and equipment, to keep this equipment in operating condition.¹³ This suggestion seems to have merit in that it not only would assure the student of more ample opportunity to practise but that it could justify its existence through savings in the replacement of equipment¹⁴ and in the better calibre of professional, technician or skilled labourer the system would turn out.

I would suggest that if there were difficulty in finding funds for mobile maintenance units within the MOE budget that this would make an excellent project for foreign technical assistance on an ongoing basis. There is absolutely no use in supplying equipment that cannot be maintained for

lack of an operating and maintenance budget, there are too many institutional testimonies to this fact.¹⁵

There is no doubt that there are tensions in opposite directions between expansion of educational opportunity and quality of education. The expansion to incorporate an additional 10% of the school age population into school in Peru costs .55% of the GNP, according to assumed relative enrollment goal proportions of 100%, 40%, 10%, for primary, secondary, university education respectively.¹⁶

This tension between quantity and quality takes on an even greater importance in face of a shortfall of anticipated national revenue. The declining terms of trade, the increasing cost of capital goods and other imported inputs compared with declining copper prices, the disappearance of the anchoveta, basis of the fishmeal industry, traditionally a large foreign exchange earner, coupled with increased energy costs have combined to limit the financial capacity of the government. This means that in spite of its good intentions there is no apparent way that the government and the MOE can do justice to this vital area of properly equipping its technical and professional educational institutions without new sources of financing and better administration in this area of responsibility.

Thus it becomes imperative to make optimum use of available resources and devise imaginative and less costly ways to facilitate good science and vocational training.

NOTES TO CHAPTER VII

¹E/CN.42/924, p. 56.

²J.R. Quezada Diaz, Instructor, Centro de Adiestramiento, SIMAC (Servicio Industrial de la Marina, Callao.)

³(Mechanics'73) and similar notations indicate the area of specialty and year of graduation as the problem of equipment etc. varies by area and time period.

⁴In at least two of the new ESEPs, for example, there were no basic tools to maintain equipment (electronic). Buses to transport students were broken down. Professors were at a loss to repair equipment for lack of practical experience. Informe, A.W.G.M. Fransen, 6/8/75.

⁵My observations are confirmed in a study of higher technical centres made in 1972 by the M.O.E. - Diagnóstico Técnico-Pedagógico de Los Centros Estatales of Educación Superior - December 1972. Item 6.5 states that "About half the centres do not have minimum equipment for practical teaching" (enseñanza práctica), also adds that there is a scarcity of materials and books. Three centres are operating in rented premises in inadequate conditions.

⁶Report on ENIT (Escuela Nacional de Ingeniería Técnica) de Cora.

⁷Almost 50% of SIDERPERU's engineers are graduates of UNI. Sr. Vicuna, instructor of SIMAC, says UNI and José Pardo graduates adapt better to industry, have better teaching methods, better equipment.

⁸Wilfredo Huertas, Course Coordinator, PRONAMEC. interview, 26/11/75. La Cantuta as it is known is the only technical teacher training institute in Peru training in the industrial specialities. Two others turn out commercial studies teachers, a technical school which employed graduates of 'La Cantuta' claimed they had to retrain them as "they had never seen machines".

⁹Text for I Ciclo de Educación Superior, ESEP, titled: Investigación Científico Natural, Coordinator - A. Cenzano Zúñiga, Dirección de Educación Superior.

¹⁰Interview with Sr. Cenzano, 5/10/75.

¹¹In the provinces there are not sufficient industries to provide 'prácticas' for all students if the system were generalized. Even the city, it was reported by respondents, 'prácticas' were very difficult to procure. Not all industries, like 'practicantes'. Several industries indicated that, in their opinion, practicantes don't have any idea of the value of a machine.

¹¹(Cont'd.)

There is also the problem in many universities of a lack of an official connection with industry. Most universities don't have an official placement officer to assist practicantes in locating prácticas (from interviews with graduates and industry). By law, industry is obliged to give the opportunity to students to gain practical experience, "within its (the industry's) possibilities". This, of course, makes the obligation very hard to enforce.

¹²Sector Assessment, (Draft) Education, U.S.A.I.D./PERU, Aug. 15/75, Sect. I, p. 12.

¹³Informe del Ing. A.W.G. Fransen del Area Profesional Electricidad, 6/8/75.

¹⁴The 28 million dollar Hungarian Credit for acquisition of laboratory and workshop equipment is being diluted substantially by delays in installation, which could have been speeded up, given the existence of such a service, effecting the saving of the need to replace equipment which will have become unusable due to these delays.

¹⁵An obvious example is the Escuela Estados Unidos, at one time a model technical school. Today, a large part of the original equipment that was donated is not functioning due to lack of maintenance and parts. There was some of the Hungarian equipment operating, but students had to furnish their own blades for the lathes. There was a desperate shortage of the simplest materials. An instructor told us that he had requested 'wipers' four months earlier and had not received them yet (5/12/75). The school was allocated 2,000 soles (\$46.50) per year for welding rods, which were consumed in no time at all, making practise impossible.

¹⁶Walter Peñaloza, Member of the Higher Council for Education, a top policy body, in Panorama General de la Reform Educativa, given at the Primer Seminario Nacional de Estudios Educativos.

CHAPTER VIII

THE TEACHING PROFESSION

Of all the areas critical to the success of the Educational Reform I do not think that many would disagree that the teaching profession is the most important, regardless of the level or modality. The Revolutionary Government of the Armed Forces has decided to build on the existing system rather than revolutionize the total structure. They have modified the structure substantially, doing away with the separate streams in general and technical education, combining them in the ESEP, in an effort to prepare every graduate of this level for a work career. They have also extended education to a section of the population that never had access before through the use of de-schooled modalities such as Educación Basica Laboral (EBL).

When I refer to teachers I am speaking generically. The teacher could be a professor at the university level or a professional instructor in a mechanical workshop, or perhaps a coordinator or "promotor" in a non-formal adult education class that stresses self-learning, such as the de-schooled ESEP program will offer in the future. Therefore it is the quality of every individual who uses his/her knowledge and experience to assist others to learn that concerns us, regardless of the structure or lack of it.

The teachers are the key to the success or failure of the Reform, so that the following assessment of the teaching profession by the Educational Reform Commission must be a cause for serious concern. "Much of the responsibility for the serious qualitative defects in the present education system lies in the inadequate selection and training of teachers, and if this is not radically modified it will not be possible to improve the system

as a whole."

One of the major challenges in training of teachers will be the attempt to change the emphasis on "dictation" and memorization that have prevailed in past teaching and learning practise to presentation of the material in a manner that will stimulate creative and analytical study and which emphasizes the practical application of theoretical knowledge to real life problems of Peru's economic development.

The Educational Reform Commission further states in discussing the need for retraining of teachers: "The difference that exists between the old and new systems of education, not only in its general features but in its conception, in its doctrine, in its goals, objectives and means, is of such magnitude that it demands a new type of teacher, as well as infrastructure, equipment, teaching material and techniques that adapt to its peculiarities."

I agree that it demands a new type of teacher, especially in the fields important to the provision of specially qualified manpower for industrialization and technology development. It will require training teachers in new teaching methodology, upgrading their knowledge in science and professional fields, in the use of new laboratory and workshop equipment and in creating links with industry for practical training of students during vacations. However, it is a moot question whether the teachers are ready to take on new responsibilities, learn new teaching methods, undergo evaluation, reclassification and retraining when they remain underpaid, have low status, and many are insecure in that they are contracted from year to year without the benefits of a permanent appointment. Even given the resolution of these difficult problems which, by the way, are exploited by radical union leaders for political purposes, there still remains the

natural apprehensiveness and related resistance to change, especially among those with seniority and ingrained traditional teaching habits.

In discussing the difficulty of introducing innovation in teaching methods and in curriculum, which of course are vital to the success of the Reform, Martín Quintana Ch. had this to say. "When changes are brought about in the education system, with new orientations and programs, the teaching profession feel displeased. They have become used to a routine work rhythm and methodology without contretemps. At the least innovation they protest. Few among them understand that their professional role requires permanent updating of knowledge and methods."²

The roots of the present dissatisfaction of the teaching profession go back to the educational policy of (President Fernando) Belaúnde (1963-68) and beyond. Education had expanded incredibly in Peru. By 1963 Peru was spending a greater proportion of its GNP on education than any other Latin American country.³ Education, being one of the few hopes for occupational advancement in fact "the only means of escape from dead-end poverty and subjection in the sierra",⁴ became a political asset to buy votes with promises of expansion of educational opportunities. But the tail soon began to wag the dog. To expand educational services an increase in the supply of teachers was required. This created employment for many, a new and more desirable type of employment with upward social mobility for the poor in a stratified society. A professor of education is quoted on this subject, "A professional degree in Peru today has become what a title of nobility was in colonial times. In the past a poor family would make incredible sacrifices so their sons could become priests or army officers to give the family some social and economic status. Now the sons and

daughters of the same kinds of families swell the enrollments of the universities, with the poorest and least-qualified entering the teacher training programs."⁵

As a result of this the demand for teacher training mushroomed. The number of students in university teacher training courses quintupled between 1960 and 1968, and normal schools multiplied eightfold, with enrollments increasing from 1,017 in 1956 to 17,590 in 1967.⁶ The increase in secondary teachers, a preferred status, was disproportionate to the needs of the educational system. In the early 1970s 23,000 students were being trained to be secondary teachers (in addition to the existing stock of teachers)⁷ for 600,000 secondary school students while only 2,700 students were preparing to be primary teachers for a primary school population of 3,000,000.⁸ This illustrates clearly the derived demand factor in the educational system, first, the desire for education for status and social mobility, and second, the employment creation factor in accordance with personal preferences as opposed to national or sectorial priorities.

The politicians, recognizing the growing political power of teachers in a "narrowly based electoral democracy in which only literates can vote",⁹ catered to this important block of voters to an amazing degree. The teachers' salaries were scheduled to be increased 100% over a period of four years (starting in 1964) and graduating teachers were guaranteed a job. The last two segments of the salary increase had to be cancelled, so great was the fiscal burden involved.¹⁰ But the damage had been done. This liberal educational policy created a monster that is frustrating educational reform and development today. An oversupply of teachers,¹¹ and worse,

teacher training institutions, had been created which was extremely difficult to reduce because of the strong and militant teacher unions that had been organized to defend the acquired rights of the profession.¹²

The teachers' unions were originally under the control of the opposition party APRA (American Popular Revolutionary Alliance) when former president Belaúnde's Acción Popular party was in power (1963-1968). Belaúnde tried to destroy the teachers' union and replace it with an organization more sympathetic to his party. History is repeating itself in this respect today as SUTEP (Sindicato Unico de Trabajadores de la Educación Peruana), the largest teachers union, purported to have 90% of the teaching profession in its ranks, continues to frustrate efforts to enlist the full support of the teachers in the implementation of the Educational Reform. Both FENTEP (Federación Nacional de Trabajadores de la Educación) and SERP (Sindicato de Educadores de la Revolución Peruana) support the government and the Educational Reform but apparently cannot marshal sufficient support among the profession to counter the influence of SUTEP.

SUTEP is reputedly Marxist led and feels the RGAF is not truly "revolutionary" but "pro-oligárquico" and "pro-imperialista".¹³ They have reportedly planned, organized and directed the disturbances of October 13, 1975.¹⁴ These included demonstrations in the streets by the students and more radical members of the teaching profession. There exists, however, a school of thinking which believes that the majority of the teaching profession are 'madres de familia' (good family mothers) who are more concerned with the economic aspects of their work; whose profession has very low status, who are attached to Lima because their husbands work there; who may even have a second job in Lima themselves and consequently have much to lose in a

transfer to the provinces. It is also said that they are very religious, nominally at least, and therefore not prone to follow the Marxist leaders in SUTEP.¹⁵

This school of thinking would indicate then that the vociferous activist group within SUTEP is the younger faction who are supporting their leaders in "acts of agitation and provocation...in deliberately planned action to destabilize the Revolution".¹⁶

Regardless of whether the political aims of the leaders vary from those of the rank and file the fact remains that the large majority of the teaching profession supports SUTEP at least to pursue their economic and associated claims against the MOE. In recent elections (July 20/75 SUTEP obtained 91% of the votes in spite of concerted opposition by the rival union SERP.¹⁷ Furthermore, SUTEP is politically astute enough to seize on the real issues of the teachers' concerns of the dwindling purchasing power of their salaries, their concerns about service in the provinces, which means transfers from Lima to areas without the amenities of urban life,¹⁸ and job stability. There are somewhere between 4,056 and 30,000 teachers contracted rather than appointed, (depending whether you accept the official statistics or SUTEP's) which indicates a legitimate concern on the part of the individual teacher concerning continuing employment.

When the Draft Law of the Teaching Profession (Anteproyecto de la Ley del Magisterio) was first published SUTEP criticized it severely. "The system of evaluation and promotion put forward by the Draft tends to become a legalized instrument of political repression in the service of the JMG (Junta Militar Gobernador?) and of the exploiting classes that it represents. It does not guarantee stability in service, automatic promotion, and increases

teaching hours...etc."¹⁹ It is apparent that SUTEP is appealing to the personal interests of the teachers, which, although in many cases legitimately pursued, are in conflict with the goals of the Reform, the Revolution, and the development of the country.

The goals of the individual are counter to the goals of the Reform in the sense that some teachers must accept transfer to the provinces if quality education is to reach all segments of the population. I know this sounds odd when we have just discussed a situation of surplus in the teaching profession. I do not have the statistics to verify it but I suspect that we can blame urban migration for this phenomenon of general surplus of teachers in conjunction with regional scarcity (see note 7). Obviously it will be the teachers without appointments (on contract only) and with less seniority that will have to accept transfer. (This could be one explanation for youthful support of radical leadership in the union.) One solution to the problem of transfers to the provinces could be the payment of a substantial bonus, on the order of fifty per cent over scale.²⁰

SUTEP is also exploiting the fears and insecurity that accompany retraining and reclassification necessary to improvement of the quality of teaching. They encourage the teacher to refuse evaluation and retraining. If they succeed in this tactic it will delay the implementation of the Reform and frustrate the ability of the educational system to provide the better qualified graduate needed for indigenous development. Therefore the MOE will have to find ways to motivate the existing teachers to cooperate in the implementation of the Reform and particularly to improve their own capabilities. The rhetoric of the Education Reform Commission says that "the Reform is counting on the desire to improve and the patriotic spirit of Peruvian

teachers who will do whatever is necessary for a radical change of attitudes".²¹ However, when you contrast that optimistic statement with the realities of the natural resistance to change on the part of the teachers, plus the politicization of the situation by SUTEP, and the economic difficulties of the country which preclude substantial financial incentives to the profession, you have to accept the fact that the needed changes are not going to take place quickly nor easily.

However difficult the task of creating a qualified teaching corps may be, it must be accomplished, and INIDE has been busy at this task the last several years. The statistics are somewhat staggering, 120,000 teachers are scheduled to be retrained.²² So far INIDE has retrained 41,541 teachers during 1972, 1973, 1974 and 1975.²³ The above will have received follow-up technical support by correspondence in 1975. In 1974, for example, 14,247 were retrained in a schooled training modality while 29,807 received re-training in de-schooled modalities. 8,949 teachers qualified in various teaching and administrative fields and 742 were given 'perfeccionamiento' courses to upgrade their teaching qualifications, such as in PRONAMEC science teaching improvement courses. In addition in 1975, 5,577 'promotores' were expected to be retrained, in a schooled mode, to prepare them for the re-training of teachers and skilled personnel to teach in EBL, CPE, and Special Education.

Retraining is an ongoing process designed for teachers presently in service who will be involved in the application of the curricula of the Educational Reform. The aim of the retraining courses is to stimulate the teachers to renew themselves in accordance with the development of science and technology applied to education, and to participate actively and creatively

in the structural and educational transformation that the country is now going through. The retraining is being achieved through a combination of formal and non-formal modes. The formal phase is accomplished in the regional retraining centres by specially trained directors, programmers and promotores of each NEC (Núcleo Educativo Comunal-Community Educational Nucleus) with the assistance of the Office of Technical Standards.

These schooled training sessions in the regional retraining centres are followed up by de-schooled courses to keep the teacher abreast of the latest developments and to reinforce the schooled sessions. These have been done largely through correspondence courses up to the present. It was announced recently however, that for the first time in Peru the radio networks were being used for the follow-up reinforcement for 20,000 teachers in the process of retraining. The teachers have been provided with guides for each broadcast. At the termination of these radio courses the participants are to be evaluated and the training program given official value. The results to date were said to be excellent.²⁴

The training for improvement of teachers is to upgrade qualifications of those without teaching certificates and also to improve capabilities of those with certificates to "widen, update, and deepen their technical-pedagogical capacity in the specialized functions according to the new demands of the educational system". This will be achieved by INIDE itself or through contract with the universities, and as mentioned earlier in both the schooled and de-schooled modes.²⁵

The above statistics are impressive but have limited value for the specific purpose of assessment of the particular type of professor, teacher or instructor that has greatest relevance in the training of the specialized

HQHR for industry and industrial research and development. There are two studies on higher technical school teachers to which I shall be referring later in this chapter.

Aside from the quality of science teaching at all levels already discussed in Chapter VI our main concern is with university professors teaching natural sciences, engineering and business administration, professors at ENIT, ISLP teachers, especially in science and professional subjects, and technical and vocational teachers in technical secondary schools, higher polytechnics and industry.

To obtain the specialized knowledge, training and experience that is necessary to become the well rounded instructor required to train industry-oriented manpower is an expensive and time-consuming proposition. One needs cognitive accumulation in a speciality, pedagogic training to properly transmit this specialized knowledge, and ideally, industrial experience to relate this knowledge to practical applications. Professors with industrial experience are able to inject a note of realism into professional and technical-vocational training as well as to facilitate the implementation of 'sandwich' programs and 'practicas vacacionales'²⁶ for students to round out their formal schooling with de-schooled training.

The British Mission which studied technical education in Peru in 1971 suggested this profile for teachers of professional subjects.²⁷ The teacher should have a good academic level, should be highly qualified in his own material (professional) and should stay up to date on methods, procedures and processes in his field, understand unifying principles derived from mathematics, science and communications. He should understand the objectives of education in Peru, know how students learn the importance

of initiative and creativity and how to stimulate these qualities in the student. He should visit industrial and commercial organizations to understand the effectiveness of such visits for the education of the student.

Technical teachers need to be qualified in three fields: (a) Professional Qualification - a diploma in business administration, science, or engineering, etc; (b) Practical experience in industry or commerce for a minimum of 5 years, (c) Teacher Training - a minimum 1 year course, full time.

These are demanding requirements, but necessary if Peru is to upgrade the quality of instruction to provide the calibre of professionals and technicians necessary to pursue a largely indigenous model of industrialization. In securing this calibre of professional and technical teacher the greatest problem arising is the adequate remuneration of such highly qualified individuals, initially to attract, and later to hold these scarce human resources that are equally attractive to industry which can afford to reward them more adequately than the educational system.

It is impossible to compete with industry for these individuals on economic terms alone. A professional can earn a minimum of 15,000 soles per month even if he is a recent graduate without industrial experience, and the range is 22,000-28,800 soles per month for qualified professionals with five years experience (see Annex VII). University professors in the best universities teaching full time can earn salaries in the same range, 15,000 to 28,000 soles, but relatively few achieve the top of the scale, this being a function of degree held, seniority, and quality of research²⁸ and is normally reserved for full professors. Again I emphasize that this is undoubtedly the top of the scale as these figures were obtained from the universities

reputed to attract the best professors due to their superior sources of funding.

The situation at the technical engineering school (INTE), the ESEPs and higher polytechnics is much more difficult in that the greater technical content in the curricula demands professors who are a great deal more practically oriented and thus more attractive, and attracted, to industry. At the same time, in spite of the greater degree of competition between industry and the aforementioned institutions for the services of technical professors, they cannot begin to compete salarywise with industry. As an example a professor at the technical engineering school is earning twice as much in industry as he does teaching full time (he teaches 8 a.m. - 2 p.m., works 3 p.m. - 11 p.m.).

In a different vein, a recent graduate from the only technical teachers' university indicated that his choice lay between teaching in the province (see note 18) at a salary of 8,500 per month, plus a height allowance, (in the Sierra presumably) giving him a total of 9,000 per month; away from home. On the other hand he could start in industry for 10,000 per month in Lima as an electronics technician, with excellent prospects of increasing his earnings as he gains experience.

Secondary teachers earn 8,000-9,000 soles per month for twenty-four teaching hours per week; a professor in the best higher polytechnic earned 11,400 per month in 1973, and professors at a good secondary technical school earned 4,300 per month for a twenty-four hour week. It is planned to offer the prospective teachers in professional subjects in the ESEPs 15,800 soles per month, roughly the same as the starting salary for inexperienced professionals in industry, and yet they will be looking for professionals

with a minimum of three years experience in industry.²⁹ These professionals will undergo pedagogical training for one month prior to commencing their teaching duties. The rationale for this approach to securing professors with industry experience is that you cannot make teachers technicians overnight so that you must attempt to make the technician (and/or professional) into a teacher.³⁰ At least this approach recognizes the fact that you cannot just pluck a professional or technician out of industry and expect him to be an instant "teacher" in the true sense of transmitting knowledge and stimulating investigative and critical interest on the part of the student. However, I fear that one month will not be nearly sufficient and that experience will prove the need for greater exposure to teacher training.

Whether the ISEPs and other technical and professional training institutions will be successful in obtaining professionals with this optimum mix of knowledge, experience and capacity to transmit effectively to the learners is unknown at the moment. It has only recently been recognized, at official policy level in any case, that this is the desired type of teacher for these institutions. The criticisms of the existing teaching staffs in universities, technical teacher training universities, technical engineering school, higher polytechnics and technical secondary schools or colegios, by specialized missions, by the Educational Reform Commission, by professors and students, by industry, all testify that these institutions have in the past been unsuccessful in attracting this optimum type of professor, teacher or instructor.

These institutions have been making do with less than the ideal, the professional with teaching and industry experience. Many of them have settled for a professional without teacher training, on a part time basis,

especially the universities. This approach has the disadvantages of (i) the probability of inability to effectively transmit knowledge and experience, (ii) lack of time to properly plan classes, (iii) evaluate students (iv) provide consultation to students (v) participate in university life in any meaningful way. These are the professors that 'teach and run' according to the respondents in my interviews of recent graduates. Several respondents dwelled at length on this point, stating that many professors had an obvious command of knowledge in their speciality. Some of these were very distinguished and well recognized in their field, authors of books etc., but had no pedagogic training. As a consequence they had poor presentation of the material. The graduates interviewed were very emphatic that all professors (including those who were full time) need pedagogic training to reach the student.

Furthermore, it is said that teachers who work part time are very prone to retire, sometimes within an academic semester. In addition it was stated that part time teachers were not well organized and could not bring their experience to the student.³¹

A further compromise implicit in the inability to adequately remunerate university professors and technical teachers is the very youthful profile of the teaching profession in those specialities attractive to industry. Analysis of the teachers in higher technical institutions showed that in 1974, 62% of the teaching staff had five years service or less. In fifteen per cent of the institutes 80% of the faculty had few years³² of service. The report stated that one cause of this youthful profile in higher technical school teaching corps was found to be the "emigration of many teachers to other sectors attracted by better wages".³³ My interviews produced a similar

response at the university level, respondents claiming recent graduates-turned-professor lack experience, pedagogic training, knowledge, and cannot transmit more than what is in the text. They are often from the same institutions and have the same weaknesses and biases as their predecessors.

Again in the higher technical institutes (state) the 1974 study revealed that although 60% of the teachers had degrees 61% had no pedagogical training, and 38% were part time. Twenty-three per cent of the institutions had more than half of the faculty on contract, or non-permanent status. Private institutes were even worse in this respect, more than 87% of their teachers were part time.

As regards the quality of teaching in professional and technical education in general the situation is as follows. Candidates for normal school with complete secondary are found to have limited education in natural sciences. It is mostly factual and not too creative,³⁴ and because of this weakness it is impossible to train adequate technical teachers. This has been substantiated in a recent survey of the newly instituted ESIPs³⁵. It was found that the presentation of material was routinely boring. Students were asked to read the text aloud in turn. There was little discussion and no application of the material. Perhaps the combination of lack of texts, equipment, professors' lack of ability in the manipulation of existing equipment, lack of industrial experience, and traditional teacher training³⁶ was just too much for the individual professor to overcome. He obviously failed to present the material in a manner to "promote a creative sense and a capacity for research and reflectiveness in the students in the fields of science, technology, the humanities and the arts"³⁷ that the Reform Commission hoped for. The foregoing is one of the objectives of the new educational

cycle created by the Educational Reform, on which the hopes for providing the bulk of the necessary high quality technicians largely rests. This indicates that there remains ahead a difficult task in the improvement of teacher training, and that it is going to be difficult to retrain existing teachers because of their weak background in natural sciences. This derives from the "very deficient component of sciences" at the basic educational level and from the 'extreme scarcity of professors capable of providing basic instruction in scientific principles and applications of same'. The result, of which we cited an example in the ESEPs, is, in the opinion of the Mission³⁸ "that it would be impossible to create and sustain satisfactory science and technology courses without having a scientific base".

Obviously this has been recognized by the MOE, and the PRONAMEC program is designed to rectify this deficiency, in time. Yet, the immediate implication for HQHR training is that it will be difficult, if not impossible to find an adequate supply of suitable professional and technical teachers in the short run due to the fact that existing teachers may not prove convertible without extensive retraining. It is probably not possible to acquire this basic scientific knowledge and application of same in the shorter courses (five weeks in the case of PRONAMEC, one month in the case of giving pedagogic training to professionals for the ESEPs).

Other problems cited in interviews are the attitude of professionals-cum-professors. It was stated that a professor in the electronics program at La Cantuta (the technical teachers university), an engineer, would not lower himself to the level of a technician to demonstrate repair of an inoperative electronic apparatus. Unless this attitude is rectified technical teaching will remain as theoretical and unrelated to reality as ever. In

another case a mechanical engineer was cited as being unable to instruct in the manipulation of equipment because he had never had practical experience in industry or elsewhere. Again, this is experience that cannot be gained in a five week course.

These are not isolated complaints, but very common to most respondents, and representative of all levels of instruction, university, higher technical schools, technical secondary, as was revealed by the recent assessment of ESEPs, even in this cycle.

There is a need to awake the interest of the student, to stimulate auto-activity on his part. There is also the need to instruct in technical drawing and shop techniques, familiarization with machinery and equipment. "You cannot develop indigenous industry with technicians who cannot draw or use tools and machines".³⁹

The difficulty of obtaining professors capable of performing all of the above is that past and present technical teacher training is inadequate, and will take time to transform (or produce the first graduates of the ESEPs, future source of technical teachers). It will be some time before Peru can count on obtaining the calibre of technical teacher needed to produce quality technicians with basic scientific knowledge and ability to apply it. The alternatives are to convert professionals and technicians to teachers. The MDE does not have sufficient financial resources to attract these scarce human resources that industry requires and can more adequately remunerate. They may succeed in attracting some, who will either be young (and inexperienced, or of lower quality, or on a part time basis only. So it does not appear that the situation will be remedied immediately. Technical teaching will continue to be a compromise unless (1) new sources of funds

can be found to hire professional technicians presently in industry and give them adequate pedagogic training; (ii) outside sources of technical teachers can be utilized to immediately upgrade the quality of technical and professional teaching, especially in the ESEPs, so that the first graduates will be acceptable as future teachers, given that they gain experience in industry via 'prácticas' during their summer holidays or immediately on termination of their academic studies. If not, I fear that there may be some improvement but not sufficient to provide the number and quality of technicians necessary for successful indigenous industrialization. One might well ask how existing industry manages at the moment and what is the projected demand for technicians? I shall attempt to deal with these questions in the concluding chapter.

The foregoing discussion has focussed largely on the teachers of technicians. Just a word on the quality of teaching in universities in science and industrial professions. While the practical content of the university curriculum in engineering is excellent in one or two universities, the majority of graduates report, as mentioned earlier, there are too many part time professors, most are too theoretical, not specialized enough in certain fields, lack ability to transmit knowledge due to lack of pedagogical training, and there is a lack of equipment. Lack of research, especially research related to real industrial problems, was also cited. This is due to lack of time on the part of faculty⁴⁰ lack of equipment, administrative red tape and lack of liason with industry, the ivory tower syndrome. Without the opportunity to participate in research projects under the tutelage of research-oriented faculty, the university student is denied a very important training ground to develop the creative and investigative spirit mentioned above. If

Peru is as short of post-graduate researchers as Sagasti asserts (see Chapter III) then this dearth of research at the university must be rectified, not only to create viable mechanisms to assist industry in the research function and to solve its technological problems, but to provide a realistic training ground for HQHR for the sectorial R & D institutes and industry itself. Promoting research projects and encouraging participation by students is an important teaching function at the university level. It is very rare now, especially in industrial research, as ITINTEC can testify, having attempted to promote same. But more of this later.

To sum up, the general level of science, professional and technical teaching requires upgrading. The better qualified teachers in these fields tend to migrate to industry due to the relative attractiveness of remuneration there. There is an active program in science teaching improvement at the basic and secondary education level, but little has been done to improve professional teaching at the university level, with one or two university exceptions. There is a crash program to supply the quality of technical and professional teacher necessary for the ESEP programs (whose curricula become more technified as of April 1976) by converting professionals into teachers via abbreviated pedagogical training.

There remains a need for closer liason with industry, which will hopefully occur in industry sponsored ESEPs such as the MOE plans to organize in conjunction with SIDERPERU. Nevertheless the ESEPs must be assured of top quality teaching in technical and professional fields if they are to fill the vacuum in the technical teacher training function that exists today in Peru. Otherwise there will be no worthwhile institutionalized technical teacher training program in existence, unless La Cantuta is rehabilitated,

121
something that has not proven possible in the past.⁴¹

Paradoxically, education was recently eliminated from the specialities offered in the ESEP program. There is also talk of utilizing ENIT graduates as teachers for the ESEPs. Two problems immediately surface. First, most ENIT graduates have been going into industry. How does the MOE expect to compete? Second, ENIT graduates interviewed criticized the weakness of the theoretical part of their training and the lack of pedagogical training. So that once more the system is opting for a compromise in an effort for an immediate solution to the problem. It is regrettable that teacher training has been eliminated from the ESEP curriculum, especially technical teacher training. As can be ascertained from the foregoing, I have not seen a better alternative proposal for technical teacher training. The university has proven itself isolated from the real needs of Peruvian development, and finds itself in a state of crisis.⁴² So it is doubtful if it can be counted on to be of service in training practical professionals suitable for teaching or teachers with professional and practical experience. There are exceptional institutions, but the graduates of these universities are in heavy demand by industry.

Therefore compromise seems to be the only way out. But is compromise good enough? Will the first graduating class of the ESEPs be any better than the old secondaries? If they are not it may be difficult to change the image that these first products of the Reform create.

NOTES TO CHAPTER VIII

¹Informe General de la Comision de la Reforma Educativa, p. 14 (General report of the Education Reform Commission) referred to as Informe General. originally published in 1970. Edition quoted is 1974 edition.

²La Prensa, Lima, 17/9/74. Martín Quintana Ch. is the author of numerous articles on education in Peru.

³Field Staff Reports, American Universities Field Staff, West Coast South American Series, Vol. XXI, No. 3, p. 10, 1974.

⁴Field Staff Reports, Vol. XXI, No. 4, p. 2.

⁵Field Staff Reports, Vol. XXI, No. 3, p. 10.

⁶Ibid.

⁷Ibid., "The secondary teacher training programs graduate about 5,200 pupils annually to meet a demand of about 1,000 new secondary teachers each year. In Primary schools there is the opposite situation, not so much for a lack of graduates as their refusal to work in the zones where they are most needed, forcing the Ministry to appoint teachers without degrees or professional studies."

⁸Ibid.

⁹Ibid., p. 11. Prior to 1968.

¹⁰Ibid. The fiscal burden and inflationary pressures generated by the raises already granted, combined with the mounting public debt and trade deficit, to force a 40 per cent devaluation in the Peruvian sole later that year.

¹¹Ibid. "By 1968 the government needed fewer than 2,000 new teachers, but the teachers colleges were graduating 9,000.

¹²Ibid., p. 12. In the Department of Ayacucho alone there were 2,000 normal school graduates without jobs in 1970, and yet attempts to close a normal school there created a political furore.

¹³La Prensa, 16/10/74.

¹⁴ Official Communication No. 68, Office of Public Relations of the Ministry of the Interior, El Comercio, Lima, 24/10/75.

¹⁵ Dr. San Martín, Director of INIDE, 26/11/75. Plan Nacional de Desarrollo Para 1971-1975, Vol. VIII, Plan de Educación Reajustado indicates in Table No. 1-02 that 56.8% of the teachers in primary, secondary and teacher training are women.

¹⁶ El Comercio, Lima, 28/10/75.

¹⁷ Sociedad y Política, Nov. 1975, p. 30. The article, El SUTEP y la Política Educativa del Régimen, is strongly biased in favour of the union, but I do not think many would dispute SUTEP is the largest teachers' union by far, even though they may exaggerate the proportion of the profession supporting them.

¹⁸ Law 15215: states that to be 'nombrado' (appointed, a permanent status, as opposed to a contract for a specific school year only) in the capital of a province there is a pre-requisite period of teaching service of three years in other parts of the provinces. To be 'nombrado' in the Lima-Callao-Balnearios area the pre-requisite teaching service period in the provinces is five years. SUTEP, apparently ignoring the needs of the provinces, wants all teachers presently contracted to be 'nombrados' in Lima.

¹⁹ Expreso, Lima, 29/10/74.

²⁰ Suggested in La Crónica, 24/2/75 - This is much more a possibility in an oil rich country, of course. Iran pays 85% over normal salary and credits 5 years seniority for each 3 years served in remote areas, J. Jackson, FAO agricultural expert who served in Iran. 24/10/75.

²¹ Informe General, p. 141.

²² Ibid., p. 143.

²³ INIDE, Plan Operativo 1975, p. 31.

²⁴ La Prensa, Lima, 9/11/75.

²⁵ Source of most of the above statistics is INIDE Plan Operativo 1975.

²⁶ Sandwich Program-alternate semesters in academic study (usually includes practical workshop as well) and in industry in work related to academic studies. ENIT has 3 out of 8 semesters spent in industry. According to the Crowther Report to the Central Advisory Committee on Education in the U.K. -

²⁶(Cont'd.)

"For technicians - key men in the community - no other training resulted as satisfactorily, as the Sandwich Course". Informe de la Misión Británica sobre la Educación Técnica en el Perú, Sept. 1971, 4.3.18.

Prácticas Vacacionales - summer employment related to academic studies. In some universities a pre-requisite to obtention of a professional degree.

²⁷Informe Británica, 7.12.1. As far as I can gather these requirements are for teaching duties only. Little research is done at this level.

²⁸Interview with professor responsible for faculty, Pontificia Universidad Católica del Perú.

²⁹Interview Dr. Saúl Collazos, Dirección General de Educación Superior (DIGES-DETES).

³⁰J. Dubé, Technical advisor to DIGES (Dirección General de Educación Superior).

³¹Diagnóstico Técnico-Pedagógico de los Centros Estatales de Educación Técnica Superior. Working Paper, June 1973.

³²Although it is not defined specifically as five years or less it is dealt with in the same paragraph and leads one to believe it refers to the same term.

³³A similar study was effected in 1974, Diagnóstico Técnico-Pedagógico de los Docentes de los Centros de Educación Técnica Superior 1974.

³⁴Informe Británica, 7.12.2.

³⁵A. Fransen, Technical advisor to DIGES, assessment of the area of professional training in Electricity and Electronics in the ESEPs of Juliaca, Cuzco, Huancayo, 6/8/75 and 15/8/75.

³⁶Dr. Walter Peñaloza Ramella, La Crónica, Lima, 10/12/75. "The deficient professional training of the large part of teachers rests in the fact that they were subject to an insufficient and anachronistic study curriculum."

³⁷Informe General of the Education Reform Commission, p. 69. Objectives of the ESEPs.

³⁸Informe Británica, 8.4.

³⁹A. Fransen, op.cit.

⁴⁰Prof. Carlos Arguedas Rivera, Jefe de la Unidad No. 3, Universidad Nacional de Ingeniería. "At UNI each professor has to teach 15-18 hours of classes per week." Added to this he must spend time in preparation of classes, evaluation of students via exams and reports, supervise practical work in the shops and labs, participate in committees, etc. All of which leaves him with little or no time for research activities.

⁴¹Universidad Nacional de Educación E.G.V. or "La Cantuta" as it is known is the only University training technical teachers. Graduates are qualified to teach in technical secondary schools. José Pardo, and the regional colleges in Chimbote and Tacna provide graduates that become technical teachers, but they have had no pedagogical training. There are two other "technical" teacher training programs in university but these are for teachers in Commercial Secondary rather than industrial professions.

⁴²Planificación y Crisis Universitaria by Virgilio Roel Pineda, p. 174. As Dr. Roel Pineda puts it, the students see the professor as a bourgeois and themselves as the proletariat in a class struggle. Anything that facilitates the students passage through the university is good, anything that raises academic standards is bad. As reported in newspapers two major student and faculty strikes took place recently in U.N.I. and Villaréal universities interrupting or stopping studies for weeks. Students at Ayacucho seized part of San Cristobal de Huamanga and the University of Arequipa was paralysed while two rectors vied for the position. The roots of the crisis are financial and political..

CHAPTER IX

BASIC RESEARCH AND TECHNOLOGICAL DEVELOPMENT FOR INDUSTRY

Peru is in the midst of a new stage of industrialization. This stage is attempting to remedy the errors of the previous stage. In spite of the efforts of Latin American countries to reduce their imports from the more industrialized countries via import substitution industrialization they still represent a market for exports of capital goods, consumer durables and chemical products from the United States three times as large as the market provided by Japan and almost as big as that of the European Economic Community. For European exporters the Latin American Market is three-quarters the size of the U.S. market.¹

In an effort to reduce its dependence on these imports and the high cost of technology, (an estimated \$2 billion per year for all of Latin America)² Peru has been emphasizing the development of national industry and national technology. The present science and technology policy is geared to eliminate the necessity to accept the total package of direct foreign investment which has proven in the past to be incompatible with national priorities. The current approach is to develop the capacity to negotiate the purchase of the technology separately and hire an engineering contractor to construct and commission the industry incorporating the new technology.

To manage, operate, expand and develop these new industries as well as the major state industries, Peru must provide the managers, engineers and technicians. To promote technological adaptation and innovation, scientists, specialized engineers and technicians will be required. The first will presumably be given basic preparation in the education system and subsequently trained in industry. Where will the

second group be prepared? According to the Plan Nacional de Desarrollo, 1975-1978, Science and Technology Policy, item 4, the intention is to "promote the development of research in universities and other research centres".³

I think it is important to recognize the inherent limitations of the university to engage in mission-oriented and applied research. This has proven limited in the past, not only in Peru and other developing countries, but also in Canada. The Report of the Special Senate Committee on Science Policy, chaired by Senator Lamontagne, points out that Canada has in past allocated a disproportionately large percentage of her R & D expenditure to the university sector.⁴

The report further states "Empirical evidence shows that the ideal location for R & D activities is where their results can be used, that is, where the innovation can be developed and introduced. This location, in an economic system mainly based on private initiative, is in industry. On the basis of what other (industrially) advanced countries are doing Canada seems to be on the wrong track."⁵

Another important aspect of the development of a scientific-technological capability singled out by the Lamontagne Report is that a demand for technology must exist to support the technological infrastructure, it cannot exist in a vacuum. The report phrases it as follows:

"The needs and opportunities for industrial research and development are strongly responsive to the economic environment and obviously the industrial base which the environment forces. In other words, the industrial load really sets the basis for the demand for technological needs, although it is a chicken and egg proposition beyond doubt."⁶

Dealing with the second point first, it would appear that Peru's current policy approach to technological adaptation and innovation is not too far off the mark. INDUPERU is attempting to build up the industrial base utilizing the 'turn-key' method to develop new industries, within the national and regional investment guidelines, that ensure indigenous control. This expanded industrial base, including now those industries formerly owned by foreign capital, creates an effective demand for industrial technology which can sustain an indigenous technological infrastructure. In the past most of the demand for technology was channeled to the parent companies abroad, as is still the case in foreign owned industry in Peru.

Thus, today, there exists an opportunity to develop a technological infrastructure that did not exist in the past. This is due to the RGAF's determination to build integrated industries in the fields where Peru has large quantities of raw materials, i.e. the iron and steel industry and its logical forward linkages in shipbuilding, the metal-mechanical industries, etc., in the bleached pulp and newsprint consumer industries of the bagasse from a large sugar industry, and in fertilizers and petrochemicals, downstream processors of the phosphates and petroleum derivatives.

Let us now return to the first point raised, the question of where the scientific-technological capability should be developed? What should be the nature of the technological infrastructure? Perhaps we can return to the Canadian experience because Canada has some problems common to both countries and has attempted to discover the solutions to these. First, we in Canada and Peru develop a small percentage of the technology we use and are therefore technologically dependent. Second, we

both have a relatively small internal market and therefore have few major industries that can sustain the critical mass of researchers required to make an individual R & D program feasible.⁷

Therefore Canada has looked, and Peru is looking, toward other institutions such as the university to produce research and researchers in the hope that industry would benefit eventually, just by virtue of their existence. Not so, as an eminent industrial representative before the committee pointed out, "...the problem with discovery, which is the area of activity that takes place in the university, is that you are seeking knowledge, but its translation into usable goods or services may not take place for a hundred years. There is very little connection."⁸

Universities have historically displayed a strong preference for basic research as opposed to mission-oriented research. The university's orientation is toward "research of a high quality leading to an advance in knowledge in the candidate's field of study".⁹ This outlook typifies the lack of interest on the part of most universities in the application of basic knowledge in industry.

ITINTEC's experience in attempting to promote a creative capacity in the universities has proven unsatisfactory so far. There are too many administrative problems involved. Apparently it has been difficult to isolate the project financially and functionally from other university activities.¹⁰ ITINTEC is now entering the second phase of their attempt to stimulate a creative capacity in universities that will produce solutions to industrial problems. They are trying to motivate professors financially by paying a salary supplement for time devoted to industrial research projects. They also offer the university remuneration for use of its

facilities but find it difficult to keep the project funds separate.

It has been difficult to find professors with the experience to lead these projects, their expertise being more in basic research.

In Peru there has been little programmed relationship between higher education and research with the consequence that the training of professionals and scientific researchers has not been the most suitable.¹¹ The crux of the problem would seem to be the need to create a research organization with leadership capable of directing the available talent to the solution of industrial problems in a systematic manner.

Why do we expect universities to perform this function? It is probably that in universities we find a concentration of scientists not existing in many other centres (if any) in developing countries. But if their research priorities and experience are not industry-oriented it is unwise to build up hopes of creating a scientific-technological potential for industry there unless ways can be found to alter these priorities.

Universities have an important function in the preparation and training of professionals for industry. I think the preparation is distorted because of the natural orientation of the university toward basic research and discovery. After all, very few students are going to do basic research and yet this is the overriding emphasis the student is exposed to in his university career. The dean of the faculty of science at one of Canada's larger university states this in no uncertain terms. He says: "We start inculcating our students right from freshman year on in our science programs that pure science is the only pursuit; that it should not be polluted or contaminated; and in what we are teaching little relevance to society ever gets into our discussions...(Graduates) find

themselves faced with two difficulties...getting jobs (and) an even worse one is the fact that frequently they do not want jobs outside. They want jobs in the university. So we have helped create this monster ourselves."¹²

There is no question that it is necessary to understand the basic principles involved in the practical application of scientific knowledge and the university has the task of transmitting these to the student, but a balancing effect is required to educate students for the real world. Universities should, to the degree possible, orient and equip students of professions related to industry to participate in the technological progress in industry. To achieve this the student must be exposed to the application, the technification of scientific principles. This has been achieved to a degree with a minority of the students in university in Peru via 'prácticas profesionales' in industry, and in ENIT, which utilizes the 'sandwich program' to ensure that all its graduates obtain substantial practical experience in industry. There have been complaints that universities in Peru are not able to train the type of professionals that industry needs. (See footnote Annex X).

Why the emphasis on the technical preparation and orientation of university students toward industry in a discussion of industrial R & D and the national technological capability? If we accept that Canada's failure to "sustain market-oriented technological innovation" is because (i) we believed in the 'talisman' theory of producing sheer numbers of scientists, many of them Ph.Ds, most of whom have no inclination to enter industry,¹³ and (ii) we invested in the university sector for research that was supposed to generate high technology industries almost spontaneously, then it behooves us to examine the logical role for universities in the development

of industrial adaptation and innovation of technology. While the university has not performed the role imputed to it by our implicit science and technology policy in the past it can certainly be more positive and contribute more directly to the national scientific-technological capability. The university should create more direct and fruitful links with industry both to train students to maximize their theoretical learning through experiencing the practical application of it while they are still able to interrelate the two, and to give the professors an opportunity to inject some degree of realism into their presentation of the cognitive material. (While I am drawing largely on the Canadian experience and comment in this section, I think much of the foregoing has relevance for the Peruvian situation, as the previous chapters and my interviews indicate.)

As an example of ways in which the university might make a more direct contribution perhaps it would be possible to select one or two universities to engage in the basic research necessary to develop national technology in a few specific areas. It would be out of the question to attempt this on a general scale because of the costs involved but might prove practical in areas of sufficient importance to the development of Peru. Areas that suggest themselves are mineral extraction and processing, or fisheries and associated industries, as both are large foreign exchange earners and vital to Peru's development.

For example UNI is in the process of creating a new specialization in Naval Engineering with the assistance of experts at SIMAC.¹⁴ In a country such as Peru which utilizes shipping extensively for the anchovy fisheries, transport of minerals, petroleum products, food and fertilizers,

and for defense, it would seem that there is sufficient demand for naval research and development.

Presently, in spite of the high quality workmanship of the SIMAC shipyards, they are still obliged to purchase ship designs abroad (Norway) and have recently licensed the technology to build marine engines up to 1200 HP from a Swiss company (Sulzer). Thus Peru is building a demand for technology that is presently being supplied externally. This demand should grow with the expansion of the shipbuilding industry. SIMAC has substantial orders on hand from the Peruvian Steamship Company (4 grain carriers) and PETROPERU (3 petroleum transports all in the 25,000 ton class) while INSA (Inversiones Navales S.A.) is to construct 10 tuna boats for Panama.

Thus there are indications that there is a continuing demand for naval research and technology development. UNI could develop a basic research capability in this field and work closely with SIMAC, which would carry out the application-innovation function. Naval technology requires a variety of professional disciplines ranging from naval architecture and design to industrial, mechanical, electronic and chemical engineering so that a broad spectrum of professionals would benefit from the opportunity to engage industry-oriented research. The students in these disciplines would benefit from direct or indirect association with this industry-oriented research program due to the interest at faculty level in developmental research.

It seems to me that it should be possible to create a fruitful interchange between the new Naval Engineering program at UNI and SIMAC, between the university and industry, without seriously undermining the

autonomy that universities treasure so highly. Universities everywhere and especially in Peru are crying for additional funds. The university will need new equipment and materials to carry out useful research for industry because the present inventory of equipment and materials is insufficient for this purpose.¹⁵ If they truly want to earn the funding they so urgently need in a society with limited financial resources it is time they aligned themselves with the real needs of the country instead of orienting their research activities to the international intellectual community. UNI and other universities could gain the support of industry in their search for funds and at the same time build a capacity to train professionals in mission-oriented research.

If Peru is determined to create a national technological capability she must decide who will perform this research function. If the university is unwilling or unable other institutions will have to be created, at a substantial cost. If there are insufficient funds for universities as a result they must share the blame.

If as was stated earlier industry is the logical site for that part of R & D activities where the innovation can be developed and introduced, then what mechanism can be utilized? In Peru ITINTEC is promoting the adaptation and innovation process in industry within enterprises that have the capacity and HQHR to carry out their own research into the local application of known technology to their own needs, with suitable adaptation. (e.g. SIDERPERU's current ITINTEC-supported project to utilize the direct reduction process, and the effort to 'coke' local coal.)

ITINTEC is the state agency charged with directing the funds to developing a technological capacity in Peruvian industry. The HQHR demands

of ITINTEC's policies would appear to be directed toward better qualified professionals and technicians rather than sheer quantity; engineers and technicians who are production-oriented but with sufficient theoretical knowledge to permit them to innovate or adapt technology at industry level.

As to technological independence, I think we have to be realistic. Neither Peru nor Canada can generate more than a small portion of the technology that it needs. Our populations and markets are too small. We can reduce our technological dependence by increasing our capacity to acquire and adapt existing technology on the best possible terms as Japan did. Japan may not spend as great a percentage of her GNP on R & D as some other advanced industrial countries but it has "comparatively large non-R & D activities, in the sector of scientific and technical information in particular, and a highly developed technical know-how, which enabled them to produce innovations quickly and successfully from the inventions of others".¹⁶

There are lessons for Peru, or any developing country, here. It is far better to concentrate on developing technical know-how than to chase the butterfly of original research. ITINTEC is on the right track in the promotion of technical know-how at the industry level, and can provide the coordinating role in the collection and dissemination of scientific and technical information.

Getting back to the problem of who does the R & D, what about those smaller industries that are unable to carry out a R & D program on their own? Here is where the sectorial institutes are planned to operate. ITINTEC will perform this function for industry. It is presently doing

some research in such areas as solar heating applied to residential construction for possible application in the Sierra. ITINTEC is slated to develop the capacity to assist the smaller industries in the field of technology and fill the gap in socially-oriented applications of technology such as the solar heating project.

However, the important thing is to recognize the additional demand for HQR that these sectorial research institutes pose. They will be difficult to staff without stripping industry of much needed scarce resources. There is some evidence that this has happened already, government being able to offer better salaries today. There are ways to fill these vital positions without penalizing the sector it is intended to assist. The attempt can be made to repatriate experienced Peruvians abroad; import foreign experts on a short term basis, (3 months to a year maximum) and send Peruvians abroad to gain similar experience in (i) other third world countries, Korea, Egypt, India or Venezuela in matching projects, (ii) for post-graduate training, short term, (iii) full degrees abroad.¹⁷

The bottlenecks foreseen in these sectorial research institutes in the next five years are: (i) the need for an engineering design capability; (ii) a critical shortage of technology project leaders needed to provide leadership in identifying projects. These latter can only gain their expertise by actually doing the same sort of work under the tutelage of experienced project leaders in industry, which means doing it abroad at least initially.¹⁸

So it is apparent that it will not be an easy task to create the technical information system and gain the technical know-how at industry

level to eventually adapt and innovate indigenously. However, given Peru's goals of relative technological independence and national industrialization it is an unavoidable price to pay. At least Peru seems to have chosen the correct approach to achieve her goals. It is now a question of organization and execution.

ITINTEC is attempting to utilize the H.Q.H.R. existent in universities by organizing mission-oriented research projects for industry there. If this approach does not yield better results in future the alternative sectorial research institute and the large industrial enterprise will assume the task by default.

NOTES TO CHAPTER IX

¹ Latin America Searches for Economic Weapons, George Radwanski quoting Enrique Iglesias, executive secretary ECLA. Montreal Gazette, 16/5/75.

² Ibid.

³ Plan Nacional de Desarrollo, 1975-1978, p. 49. (Peru)

⁴ Canada in 1967 was allocating 26.7% of its national R & D expenditure to the university sector. The amount expended by business enterprise in Canada for R & D was less than most other industrialized nations (see Annex XI) A Science Policy for Canada, Report of the Senate Special Committee on Science Policy, Senator Maurice Lamontagne Chairman referred to at times as the Lamontagne Report, pp. 128, 129, 130.

⁵ Ibid., p. 130.

⁶ Ibid., p. 236 and 122.

⁷ U.S. International Firms in R, D & E in Developing Countries, National Academy of Sciences, Washington, D.C., p. 34 and Lamontagne Report, p. 122.

⁸ Lamontagne Report, p. 237. Mr. V.O. Marquez, president of Northern Electric Co. Ltd., (now known as Northern Telecom, perhaps Canada's biggest and most advanced private investor in R & D) also Arthur J. Cordell, in The Multinational Firm, Foreign Direct Investment and Canadian Science Policy, cites: In 1970 Northern's total R & D expenditure was over \$50 million. The R & D division employed in 1969 over 2,000, including 540 bachelors (degree) 135 masters and 52 PhDs., p. 51.

⁹ Lamontagne Report, p. 147. Excerpt from the graduate calendar of the University of Alberta, Canada.

¹⁰ Ingeniero Gustavo Flores Guevara, Director de Tecnología del ITINTEC, 15/10/75.

¹¹ Investigación Científica y Técnica en El Perú (I) Robert Santander Estrada, La Prensa Lima 6/11/75.

¹² Lamontagne Report, p. 146.

¹³ Lamontagne Report p. 247, some witnesses.

¹⁴Ing. Cesar Romero Chigne, Head of Industrial Development, SIMAC.
Interview 3/12/75.

¹⁵Investigación Científica y Técnica en el Peru (II) Roberto Santander Estrada, La Prensa 7/11/75.

¹⁶Lamontagne Report, p. 120.

¹⁷Interview Fransisco Sagasti 11/12/75.

¹⁸Ibid.

CHAPTER X

CONCLUSIONS

The Peruvian model of development includes policies designed to rectify many past social and economic impediments to development. Recognizing that to be selective or slow to implement reforms would create new injustices and delays that could prejudice the success of the Revolution the RGAF has attempted much in a short period. The reforms such as in education have been far reaching and extremely costly, and recent government revenues have been inadequate for the task.

Without increased revenues the choice will be imposed on planners in education, generalization at the sacrifice of excellence or vice-versa. Up to the present the emphasis has been on the generalization of the Education Reform at these costs: (i) inability to attract and hold highly qualified teachers for professional and technical education (ii) inadequately equipped locales for research activities and technical and science teaching.

Unless these problems can be solved highly qualified and skilled human resources will continue to be adequately trained only in educational institutions with outside sources of financing, which, because they are relatively few, will limit the numbers trained. Without adequate funds for research and researchers industrial technology will continue in the main to be imported and adapted by industry.

Even given the solution to the economic requirements of education there remain the following problem areas in the preparation of highly qualified and skilled human resources for indigenous industrialization: the need (i) to popularize science and technology to make them an integral part of Peruvian culture. (ii) to substitute intelligent analysis and

application of scientific principles for memorization and repetition in the teaching-learning process (iii) gain the support and cooperation of the teaching profession in modernizing and upgrading its qualifications (iv) increase the social and economic rewards to the technician and middle management to motivate students to willingly enter these occupations basic to successful industrialization and maintenance in a mechanized society. (v) create viable and productive industrial research organisms in university and/or sectorial institutes and/or in large enterprises, and effective communication between these.

Success in the five areas above should do much to remove the negative attitudes to 'industrialismo' and 'maquinismo' in Peru and better prepare human resources for a modern industrialized society to obtain a better standard of living.

As the Argentinian Nobel Prize winner Houssay phrased it: "Science and Technology have become essential factors in the life and progress of nations, because health, agricultural and industrial production, the hierarchy and prestige, the power and even the independence of nations depend on them. Less developed countries are obliged to choose between these alternatives: science or misery."¹

OECD studies point out: "Furthermore, the transfer of knowledge between science and technology is mainly 'person embodied': in other words, it takes place through people talking to one another, or through people moving from one institution to another."²

Peru seems to have chosen science over misery. Now she needs the people who can apply science and technology to the goals of socio-economic development and must set her priorities accordingly.

NOTES TO CHAPTER X

¹Mario Samané Boggio, Aplicación de la Ciencia y la Técnica al Desarrollo, La Prensa, Lima, 28/10/75

²O.E.C.D., The Conditions for Success in Technological Innovation, p. 14.

ANNEX 1

A SURVEY OF FOREIGN SPECIALISTS WORKING IN PERU

In an attempt to assess the character of the demand on professional and technical education I made a survey of the number and general category of foreigners working in Peru. In evaluating these statistics I have correctly or incorrectly made several assumptions. First, given the indigenous orientation of the RGAF's development plan, (with which I am in full accord because I believe that a developing country must inevitably develop her own people to achieve development from within) I assume that if there were a Peruvian available for the position he would have filled it. In other words, that there exists a shortage of certain types of manpower. This concept is mitigated to some extent by the stipulation of foreign investors and aid programs that foreign experts supervise the program or investment.

Secondly, due to the confidential nature of some of the associated information I was not able to obtain full details as to the actual length of stay, only the permitted stay, which I, perforce, had to assume was the actual stay. i.e. The period covered by the survey was July 1972 to June 30, 1975. If a visiting work permit was valid for 36 months or more on entry in July 1972, I presumed the individual still present in the country in June 1975. On this basis there were approximately 2,110 foreigners working in Peru as of June 30, 1975.

While I do not impute any statistical representativeness to the survey made, I do feel that it is an indication in broad terms of the type of manpower that is relatively scarce in Peru. Taking the six month period January 1975 to June 1975 as representative of the most recent trends we can state the following.

Of the total number of foreign experts entering Peru during this period 28.9% were technicians. Supervisory personnel made up 20.1% of the total; of this group over four fifths were in technical occupational categories as well, indicating that altogether 45.5% of all entrants in the period were either technicians or technical supervisors.

Other important categories were managers and assistant managers with 17.2% of the total, while 7.5% were engineers and 7.2% were professors.

These proportions would seem to justify the general claim that Peru is short of technicians and mando medio (middle management) as they are the largest categories by far. The statistics also tend to support the findings of the Consejo Nacional de Investigación (C.N.I. - National Research Council). Their publication Recursos Humanos Científicos y Tecnológicos, Sector Productivo (1974) states in its conclusions "The scarcity of specialized national personnel obliges firms to resort to foreign personnel; however this only amounts to 5.3% of total scientific and technical personnel existant in the country".

Utilizing the CNI's figure of the number of management, professional and technical personnel in Peru in 1970 (table 15, p. 24), which was 21,915, and applying the 5.3% ratio, we arrive at the figure of 1,161 expatriate personnel in this group. The difference between this figure and mine (which would indicate approximately 10% were foreign personnel) can possibly be explained by the differing time periods dealt with and the classification differences. The salient fact revealed in either analysis is that a shortage of specialized personnel exists in Peru.

Source: Ministry of Labour.

ANNEX II

(vi)

EFM/44
CHART N° 2

EDUCATIONAL STRUCTURE

EXISTING

II REFORM PROPOSALS

CALENDARIO DE APLICACION DE LA REFORMA DE LA EDUCACION

CALENDAR OF APPLICATION OF THE EDUCATIONAL REFORM

Source: Plan General de Conversión, Ministerio de Educación, Lima, Peru, June 1975.

ANNEX II (b)

CALENDARIO DE APLICACION DE LA REFORMA

CALENDAR OF APPLICATION OF THE REMORM

PRIMER CICLO DE LA EDUCACION SUPERIOR

FIRST CYCLE OF HIGHER EDUCATION

Grados educativos en el nuevo sistema Grades now in New System

Años de estudios en el sistema tradicional Years of study Still in Traditional System

* Para algunas opciones serán 8 semestros. Some options will be 8 semesters.

ANNEX III

INTERVIEWS WITH RECENT GRADUATES

The personal interviews were conducted with relatively recent graduates of the formal educational system in professional, technical and skilled labour fields (university, higher technical schools, trade schools). The size of the sample was restricted by time and budgetary constraints but the interviews were made in depth with each respondent and the attempt was made to cover as many institutions and specialities (professions and trades) as feasible within the possibilities. Many respondents were able to assess a number of institutions, having attended several from *secundaria técnica*, *secundaria común*, higher technical or polytechnics, university, a few in post-graduate degrees, and many in post-graduate diploma courses.

Some were able to speak as former students only, while some could speak as professors as well, being of the double occupation (teaching and working) category, which added a larger dimension to the statistically small sampling than might be expected.

There is no attempt to present the results as being a statistically reliable cross section of all recent graduates of the educational system. However, in spite of obvious biases that might exist, the results do indicate some problem areas requiring improvement if the goal of providing the necessary calibre of highly qualified human resources is to be realized.

I selected relatively recent graduates in the disciplines related to industrial fields who were actually working in industry because I felt they would have sufficient experience in industry, on the average, combined with good recall of their formal education to evaluate it in the light of their experience in finding a job and the capacity to do it well.

However, in a developing country with a relative scarcity of good jobs the competition becomes fairly intense, and, barring personal connections which are frequently used to secure employment, the most motivated and best prepared succeeded in securing employment. So that I gradually realized that I was dealing with the *crème de la crème*, the best educated and adapted graduates of the last few years, most of whom had several degrees or diplomas. Nevertheless, their economic backgrounds varied considerably. Although fifty percent came from families earning less than two hundred dollars a month the range was significant. I do not feel that the fact that the respondents are from the most successful group of graduates makes their criticisms and suggestions for improvement less valid. In fact it is my feeling that they are probably more perceptive than the average graduate, and certainly more qualified to state whether they were properly prepared or not.

Finally, in the process of locating these recent graduates in the professional and technical fields I was able to solicit industry's evaluation and criticism of the preparation of the product of the educational

system through discussion with all levels of management and more especially with the personnel officers in these industries.

The industries covered were electronic, textile, automotive, pharmaceutical, shipbuilding and industrial development. Two were state enterprises and four were private. There were sixty-two respondents representing the following institutions and specialities:

<u>Universities:</u>	- Mayor de San Marcos	Post Graduate:	ESAN (Business Admin.)
Universidad	- De Ingenieria		Escuela Superior de
" Nacional	- Agraria (La Molina)		Administración de
" "	- Del Centro del Peru		Negocios
" "	- Federico Villareal		
" "	- Técnica del Callao		
" "	- De Educación E.G.V.		
"Particular	- Católica del Peru		
" "	- De Lima		
" "	- Del Pacifico		
" Nacional	- San Martín de Porres		
" Nacional	- Ricardo Palma		

Technical University: - Escuela Nacional de Ingeniería Técnica (ENIT)

ESEP (Escuela Superior de Educación Profesional)
ESEP de Lima

Higher Technical Institutes

Instituto Nacional Superior José Pardo
Instituto Peruano de Administración de Empresas (IPAE)
Metropolitano
Instituto Superior de Administración de Empresas (ISAE)

Politecnicos:

Salesiano
Varones del Callao
Feminino del Callao

CECAPE Escuela Estados Unidos
Jesus Obrero

Disciplines covered: Post Graduate Level: - Business Administration
Undergraduate Level: - Business Administration

Industrial Relations

Accountant

Economist

Engineering: -

Industrial

Mechanical

Electronic

Chemical

Electrical-Mechanical

Agricultural

Technical Education:	-	Bachiller en Educación Técnica (Electronics)
Technical Engineers:	-	Electrical
(ENIT)		Plant Mechanics
		Automotive Mechanics
		Metallurgical
Technicians:		Electronic
(Instituto Superior)		Electronic
		Mechanical
		Automotive Mechanics
		Business Administration
		Contador Mercantil - accountant
Skilled Labour:	-	Automotive Mechanic
(SENATI, CEEAPE)		Lathe Operator

Professors of
Higher Technical Education

ENIT, José Pardo

Professors,

ESEP de Lima

University Professors

UNMSM (San Marcos)

San Martin Porres

UNI (Universidad Nacional de
Ingeniería)

La Católica

ANNEX IV

EFFECT OF EDUCATION ON EMPLOYMENT AND INCOME IN PERU

1970	Level of Education Economically Active Population	Average Monthly Income of Employed (soles)*	Proportion of Unemployed (urban) And underemployed**
No Schooling	24.2%	840	66%
Primary Education	52.7%	3,000	33%
Secondary Education	17.8%	5,500	30%
Higher Education	5.3%	10,000	22%

*1975 - 43 soles = \$1 US.

** Underemployed includes all those who work less than thirty-five hours per week and those who, although working thirty-five hours or more, earn less than the legal minimum.

Source: SERH-CEMO Encuesta Nacional de Hogares, 1971.

ANNEX V

TEACHERS SALARIES

(soles per month)
(43 soles = \$US 1.00)

Basic remuneration (not including family allowance, etc.)	<u>1975</u>	<u>1973-X4</u>	<u>Pre-1973 range</u>
Category I, over 15 years	10,000	7,800	a very wide
Category I, under 15 years	8,800		range from
Category II	7,000	6,600	1,800-14,000
Category III	7,000	5,400	

Included in the above scale of remuneration are the following:

Initial school teachers	
Primary school teachers	Basic Regular (E.B.R.)
Secondary school teachers in these modalities	Basic Laboral (E.B.L.)
Technical Secondary teachers	Extraordinary Professional (C.P.E.)

Not included in above scale; ESEP, José Pardo, SENATI.

Teachers' salaries as a percentage of total Ministry of Education Budget;

26,834,745/39,822,117 soles = 67.39%.

Education Sector Budget as a percentage of National Public Budget = 20%

N.B. Education Sector also includes Universities, National Recreation Institute, Institute of Culture, Scholarships and Credits, National Geophysical Institute, and transfers for pensions.

Interview with Professor Acuña
Budget Director, M.O.E.
11/12/75.

ANNEX VI

UNIVERSITY PROFESSORS SALARY RANGE (soles per month) 43 soles = \$ U.S. 1.00

University	La Católica (private) Lima	José Sanchez Carrión (state) Huacho	Técnica del Altiplano (state) Puno
Profesor Principal (f) degree, seniority quality of research	to 28,000	29,400	not advertised
Profesor Asociado	22,000	20,400	7,600 (part time) (Agr. Eng. w/post-grad.
Profesor Auxiliar	15-18,000	15,400-20,400	15,400
Jefe de Prácticas	-	11,800	not advertised

Universidad Nacional de Ingeniería

Profesor Principal	25,000
Profesor Asociado	20,000
Profesor Auxiliar	15,000
Jefe de Practicas	11,000

Source: Interviews with budget departments in La Católica and UNI, and
Advertisements in Lima newspapers. Nov/Dec. 1975.

ANNEX VII

SALARY LEVELS OF PROFESSIONAL AND TECHNICAL PERSONNEL IN INDUSTRY (as advertised in Lima newspapers in November and December 1975)

Private Industry

<u>Profession</u>	<u>Experience demanded</u>	<u>Salary Range</u>
Industrial Engineer	none	15-25,000 soles per month
Mechanical Engineer	1 year	15-25,000 " " "
Petrochemical Engineer	1 year	15-25,000 " " "
Mines and Geological Eng.	none	19-22,000 " " "
Civil Engineer	2 years	25,000 " " "
Industrial Relations or Business Administration degree	3 years	37,333 " " "

State Enterprise

Chemical Engineer	5 years	22-28,000 soles per month
Mechanical Engineer	"	" "
Mathematical Physicist	"	" "
Electrical Engineer	"	" "
Electronic Engineer	4 years	27,000 "
Mechanical Engineer	"	" "
Civil Engineer	3 years	22,000 "
Bachiller Economics, Acctg., Admin.	2 years	15,400 "
Executive Secretary	2 years	10,600 "
C.P.C. (Public Accountant)	1-2 years	16,666 "

ANNEX VIII

BALANCE OF TRADE 1970-1975
(in dollars)

Year	Trade Balance	Exports	%	Imports	%
		Millions		Millions	
1970	334	1,034	17.6	700	6.2
1971	159	889	-14.0	730	4.3
1972	133	945	6.3	812	11.2
1973	79	1,112	17.7	1,033	27.2
1974	-403	1,506	5.4	1,909	84.8
1975					
June	-524	722	-7.8	1,246	39.2
December*	-985	1,506	0	2,491	30.5

*Estimated

Source: Economía Peruana, La Balanza Comercial. La Prensa, Lima, October 10, 1975. Statistics supplied by Minister of Economía y Finanzas in public address.

ANNEX IX

INCREASE IN PERSONNEL FOR THE EXPANSION OF SIDERPERU (1975-1981)

Workers	Present	Increase	Total
Workers:			
Unskilled	1,151	711	1,862
Semi-skilled	1,031	1,267	2,298
Skilled	411	1,222	1,633
Employees			
Engineers	330	232	562
Other Professionals	116	105	221
Technicians	430	855	1,285
Clerks (empleados)	1,228	911	2,139
	4,697	5,303	10,000

ADDITIONAL SKILLED WORKERS REQUIRED FOR SIDERPERU AND ASSOCIATED INDUSTRIES BY 1981

SIDERPERU -1,222 ASSOCIATED INDUSTRIES - 2,389 TOTAL - 3,606

COMPARATIVE TABLE BETWEEN GRADUATES AND REQUIREMENTS OF SKILLED LABOUR (CHIMBOTE-TRUJILLO AREA)

Speciality	Graduates of Secondary Colleges	Requirements		Total Required	Deficit
		SIDER PERU	ASSOCIATED INDUSTRIES		
Gen. Mech.	137	365	730	1,095	960
Gen. Elec.	125	480	960	1,440	1,315
Electricity	52	158	316	474	422
Carpentry	31	3	6	9	-
Prof. Drawing	16	37	14	51	35
Automotive	65	-	-	-	-
I.B.M.	-	6	12	18	18
Metallurgy	-	144	288	432	432
Total	426	1,193	2,326	3,519	3,182

N.B. The Higher Technical Regional College of Chimbote is the only existant institute training technical personnel, from which technicians with the title of Bachiller graduate. The number of specialities and graduates is scarce in relation to the requirements. Furthermore, these recently graduated professionals do not generate much confidence nor are they well received by the firms. (Translation of footnote)

Source: Tables 1, 2 and 4 of Terminos De Referencia Para Un Plan De Capacitacion En La Zona De Chimbote, a study by URDEZA, Direccion Sub-Regional Costa.

ANNEX X

INDUSTRY AND TOURISM SECTOR

REQUIREMENTS FOR PROFESSIONALS WITH POST-GRADUATE TRAINING WITHIN SECTOR 1975-1980

Total	1975	1976	1977	1978	1979	1980
328	122	95	61	24	16	10

Major areas of specialization - cost accounting and financial control, planning, quality control, marketing, petrochemicals, mechanical, production processes.

SIDERPERU REQUIREMENTS FOR PROFESSIONALS (stated separately) Engineers 232
Others 105

Major areas - Engineering - Industrial (22.7%) Chemical (16.5%) Mechanical (14.9%)
of Metallurgical (13.7%) Mechanical-Electrical (13.7%)
specialization
Others Public Accountant (25%) Business Administration (19.8%)
Professors (18.9%) Economist (11.3%)

EXISTING PROFESSIONALS REQUIRING TRAINING 1975-1980 M.I.T. SECTOR

Type of Training	Number	Duration	Credit
Total	509		
Modernization of Professional Knowledge	60	minimum 1 semester	certificate
Broadening Knowledge	222	" "	"
Specialization	151	" 2 semesters	Degree
Masters Degree	23	" "	"
In-Plant Training	55	not specified	

SIDERPERU- Existing Professionals requiring Retraining - 1070 participants

Areas of Specialty - statistics, internal control, quality control, English, organization, automatic controls, various areas of technical expertise.

Note: During the course of the survey of the various institutions and firms in the sector, a concern was expressed of the inability of the labour market to supply the professionals that they required because there was no possibility to train them in local universities given the type of training existant in same.* The situation was more acute in certain firms such as Empresa de la Sal and the Empresa Siderurgica (SIDERPERU) among others due to the type of production involved.
*emphasis mine.

Source: Sectorial Planning Office, Ministry of Industry and Tourism

ANNEX XI

CHART 4 ILLUSTRATING TABLE 5

TOTAL NATIONAL R&D EXPENDITURES BY SECTORS OF PERFORMANCE AND COUNTRY IN 1967 (PERCENTAGES)

"Canada is at the bottom of the list as far as R&D performed by industry is concerned, but at the top when it comes to the government and university sectors . . . Canada appears to be on the wrong track."

129

90718-10

Source: A science policy for Canada, Report of the Senate Special Committee on Science Policy, Chairman: The Honourable Maurice Lamontagne, P.C. Volume 1 A Critical Review: Past and Present, Queen's Printer, Ottawa, 1970.

ANNEX XII
CUADRO N° 11

INDUSTRIAL SECTOR: PUBLIC INVESTMENT IN PRE-INVESTMENT AND WORKS
SECTOR INDUSTRIAS: INVERSION PUBLICA EN PRE-INVERSION Y OBRAS
AND EQUIPMENT Y EQUIPOS 1975 - 1978
(Millones de Soles) (43 soles = \$US 1.00)

PROYECTOS	Costo Total Total Cost	Invertido al 31-12-74 Invested To 31/12/74	Periodo 1975-1978 Balance	Saldo
Pre-Inversión				
1. Complejo Petroquímico Petrochemical Complex	100.0	16.0	84.0	—
2. Complejo Farmoquímico Pharmachemical "	60.0	20.0	40.0	—
3. Complejo de Fertilizantes Fertilizer "	50.7	0.7	50.0	—
4. Complejos Agroindustriales Agro-Industrial "	30.0	—	30.0	—
5. Plan de Expansión de la capacidad de pro- Expansion of ducción de cemento cement production	70.0	2.0	68.0	—
6. Complejo Calderero y Estructural Boilermaker &	42.8	2.5	40.3	—
7. Laminados y Extruidos de Cobre structural comp	30.0	9.0	21.0	—
8. Otros* Copper Lammates and Extrusions lex			118.0	—
Others				
SUB-TOTAL			451.3	
Obras y Equipos (1)				
1. Balanceo Planta Siderúrgica Steel Plant	2,497.6	597.0	1,918.6	—
Expansion Steel Plant in Chimbote				
2. Ampliación de la Planta Siderúrgica de Chimbote	40,314.5	40.0	9,952.0	30,322.0
3. Tractores Agrícolas Agricultural Tractors	91.8	15.7	63.3	12.8
4. Máquinas Herramientas por Arranque de Viruta Machine tools and Lathes	373.3	22.8	295.6	54.9
5. Motores Diesel Deisel motors	478.4	13.4	423.4	41.6
6. Papel Periódico Newsprint	2,129.0	170.1	1,958.9	—
7. Pulpa Blanqueada Bleached Pulp	3,908.7	—	3,908.7	—
8. Ampliación Astilleros Sima-Perú Expansion of	2,648.4	120.3	2,528.1	—
9. Otros** Sima-Perú shipyards.			9,256.3	—
SUB-TOTAL			30,304.9	
TOTAL			30,756.2	

* Incluye estudios del Complejo Automotriz, Complejo de Máquinas Herramientas y estudios de Proyectos Químicos y Siderúrgicos.

(1) Incluye estudios definitivos.

** Incluye, entre otros, los siguientes proyectos sujetos a opinión del Sistema Nacional de Planificación: Complejo Farmoquímico, Complejo Petroquímico, Complejo Calderero y Estructural de Chimbote, Laminados y Extruidos de Cobre, Ampliación Cemento Yura, Ampliación de Papelera Trujillo, Ampliación de Paramonga Ltda., Ampliación Cemento Lima y Cemento Pacasmayo.

Source: Plan Nacional de Desarrollo 1975-1978, Instituto Nacional de Planificación, Peru.

BIBLIOGRAPHY

- Alonso, Marcelo, "Integration of Science and Education in Latin America", Science and Education in Latin America, Gillon, Philip and Hadassah, (eds.) Rehovot Conference, 1969, Praeger, 1971.
- Anaya Franco, Eduardo, Imperialismo, Industrialización y Transferencia de Tecnología, Editorial Horizonte, Lima, 1975.
- Balogh, Thomas, Education Must Come Down to Earth, CERES, March/April, 1968
FAO review, Rome.
- Cenzano Zuñiga, A., ed. Investigación Científica Natural, text for First Cycle Higher Education, Ministry of Education, Dirección General de Educación Superior.
- Comisión de la Reforma Educativa, Reforma de la Educación Peruana, Informe General, Lima, 1974.
- Consejo Nacional de Investigación, Recursos Humanos Científicos y Tecnológicos, Sector Productivo, Lima, 1974.
- Consejo Nacional de Investigación, Scientific and Technological Potential of Peru, Department of Scientific Affairs, O.A.S., Washington, D.C.
- Consejo Nacional de la Universidad Peruana, Boletín No. 7, Crecimiento Cuantativo de la Población Universitaria, Años: 1964-1974.
- DeCora, Informe Sobre la Escuela de Tecnología de la Universidad Nacional de Ingeniería, (now known as ENIT) January, 1971.
- Dore, R.P., Education in Japan's Growth, Pacific Affairs, Spring 1964, Notes and Comments.
- Economic Commission for Latin America (ECLA) E/CN.12/924, November 25, 1971. Secondary Education, Social Structure and Development in Latin America, United Nations Economic and Social Council.
- Economic Commission for Latin America, Latin America and The International Development Strategy: First Regional Appraisal. E/CN.12/947, United Nations Educational, Scientific and Cultural Organization, May 2, 1973.
- Economic Survey of Latin America, 1973.
- Fransen, A.W.G., Observaciones y Notas Críticas, Lima, October 1973.
- Gall, Norman, Peru's Education Reform, Field Staff Reports, Volume XXI, Nos. 3, 4, 5, 6, West Coast South America Series, December, 1974.
- Hetzler, S., Applied Measures for Promoting Technological Growth, Routledge, London, 1973.

INDUPERU, (Industrias del Perú) INDUPERU en la Feria, November, 1975.

INDUPERU, Peru, Challenge and Response, 1971.

INIDE (Instituto Nacional de Investigación y Desarrollo de la Educación Augusto Salazar Bondy), Ministry of Education, Plan Operativo 1975.

Instituto Nacional de Planificación, Plan Nacional de Desarrollo, 1975-1978.

ITINTEC (Instituto de Investigación Tecnológica Industrial y Normas Técnicas) Boletín No. 13, January 1975, and Boletín No. 17, May, 1975.

Latin America, October 28, 1970.

Litvak, Maule and Robinson, Dual Loyalty, Canadian and U.S. Business Arrangements, McGraw-Hill Canada Ltd. 1971.

Mariátegui, José Carlos, 7 Ensayos de Interpretación de la Realidad Peruana, Empresa Editora Amauta, Lima, Peru, 31st edition.

Ministerio de Educación, Dirección General de Educación Superior - Dirección de Educación Técnica Superior, Diagnóstico Técnico-Pedagógico de los Centros Estatales de Educación Técnica Superior, Documento de Trabajo, June 1973.

Ibid., Diagnóstico Técnico-Pedagógico de los Docentes de los Centros de Educación Técnica Superior, 1974.

Ibid., Matrícula y Egresados Durante los años 1973 y 1974 de los Centros de Educación Técnica Superior.

Misión Británica, Informe Sobre la Educación Técnica en el Peru, September, 1971.

The Monopolies Commission, U.K., A Report on the Supply of Chlordiazepoxide and Diazepam, April 11, 1973, H.C. 197, Her Majesty's Stationery Office, London.

Organization for Economic Co-operation and Development (OECD), The Conditions for Success in Technological Innovation, Paris, 1971.

Organization for Economic Co-operation and Development, Human Resources, Education and Economic Development in Peru, OECD, Paris, 1967.

Organization for Economic Co-operation and Development, Human Resources, Education and Economic Development in Peru, OECD, Paris, 1967.

Pearson, Lester B., Chairman, Partners in Development, Report of the Commission on International Development, Praeger, New York, Washington and London, 1970.

Price, Waterhouse, Peat and Co., Information Guide for Doing Business in Peru.

- PRONAMEC, a revised and updated version of a presentation by Prof. C.A. Quiroz to a meeting on the Improvement of Science Teaching, Venezuela, December 1974., PRONAMEC (Programa Nacional para el Mejoramiento de la Enseñanza de las Ciencias.) Ministerio de Educación/UNESCO/UNICEF.
- Quarterly Economic Review, Peru-Bolivia, No. 3-1974, The Economist Intelligence Unit, London.
- Roel Pineda, Virgilio, Planificación y Crisis Universitaria, Lima, Peru, 1974, Editorial Grafica Labor.
- Sagasti, Fransisco R., Framework for the Formulation and Implementation of Technology Policies: A Case Study of ITINTEC in Peru., February 1975. Mimeo.
- Science and Technology Policy in the Andean Common Market Countries, November, 1975. Mimeo.
- Salazar Bondy, Augusto, La Reforma de la Educación Peruana, Cuadernos del Consejo Nacional de la Universidad Peruana, September, 1972.
- Sociedad y Política, November 1975, El SUTEP y la Política del Regimen.
- Stokes, William, The Pensadores of Latin America, in The Intellectuals, George B. de Hozar, Free Press, Glencoe Illinois, 1960.
- Tinbergen, Jan, Development Planning, World University Library, McGraw-Hill Book Company, New York, Toronto, 1967.
- Truchis, Manuel, Problèmes Agraires et Développement au Pérou, Développement et Civilisation, Vol. 51, Jan. Mar. 1973, p. 10-20.
- United Nations Conference on Trade and Development, Issues in the Transfer of Technology, Case Study of Chile, UNCTAD, TD/B/AC.11/20.
- United Nations Educational, Scientific and Cultural Organization, Scientists Abroad, A study of the international movement of persons in science and technology. UNESCO, Paris, 1971.
- United States Agency for International Development, Sector Assessment (draft) Education, USAID/PERU, August 15, 1975.
- Versluis, Jan, Education and Employment, Labour Market Expectations of Secondary and University Students in Lima Metropolitan Area, World Employment Program Research Working Papers, International Labour Organization, Geneva.
- Whyte, William Foote, and Flores, Graciela, High Level Manpower in Peru, in Manpower and Education, Frederick Harbison and Charles Myers, eds. McGraw-Hill, New York, 1965.
- Wionczek, Miguel S., U.S. Reaction to the Andean Group System of Treatment of Foreign Capital, Comercio Exterior, June, 1971.

Cordell, Arthur J., The Multinational Firm, Foreign Direct Investment, and Canadian Science Policy, Background Study for the Science Council of Canada, Dec. 1971, Special Study No. 22.

Report of the Senate Special Committee on Science Policy, Senator Maurice Lamontagne Chairman, A Science Policy for Canada.

END

6057

FIN