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ABSTRACT

The effectiveness and efficiency of basic education in the Third World has aroused considerable debate. This publication provides a comprehensive overview of the literature on various aspects of Third World basic education. The literature review has been divided into four sections corresponding to the different domains of school outcomes: (1) the modernizing effects of schooling; (2) the effects of school-acquired literacy and numeracy on cognition; (3) the relationship between schooling and employment, earnings and productivity; (4) the relationship between schooling and such benefits as health, nutrition, and fertility control. A critique of the traditional "rate of return" analysis is also provided. The survey draws four major conclusions: that schooling may foster the adoption of modern values and beliefs that change perceptions of self and society; that school literacy fosters profound cognitive changes in the ability to employ and manipulate formal logical structures in reasoning with and from printed texts; that schooling may increase productive capacities, equipping individuals with skills valued in wage/salary employment and related to the production of foodstuffs with products and processes of modern technology; and that school participation improves health and lowers fertility mainly through these other combined effects. A list of 107 references is included. (TE)

# Benefiting from Basic Education in Developing Countries: A Review of Research on the External Efficiency of Educational Investments



Thomas Owen Eisemon

Special Studies in Comparative Education

Number Twenty

COMPARATIVE EDUCATION CENTER

FACULTY OF EDUCATIONAL STUDIES
STATE UNIVERSITY OF NEW YORK AT BUFFALO

# BENEFITING FROM BASIC EDUCATION: A REVIEW OF RESEARCH ON THE OUTCOMES OF PRIMARY SCHOOLING IN DEVELOPING COUNTRIES

Thomas Owen Eisemon

Special Studies in Comparative Education

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Comparative Education Center
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# FOREWARD

Basic Education is a key issue in education in the Third World. There has been considerable debate concerning the effectiveness and efficiency of basic education. This Special Studies publication focuses on the various aspects of basic education, including literacy, school achievement, the effects of schooling, education and health, education and agricultural productivity, and related issues. A critique of the traditional "rate of return" analysis is also provided. This publication provides a comprehensive overview of the literature and places this important and increasingly controversial literature in a broader societal and educational context.

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We are pleased to present this publication as the 20th in the Comparative Education Center's Special Studies Series

Philip G. Altbach

Director

# Benefiting from Basic Education: A Review of Research on the Outcomes of Primary Schooling In Developing Countries*

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Twenty years of research on the external efficiency of educational investments in developing countries has produced a rationale persuasive to governments and foreign donors for expanding access to schooling, raising levels of educational attainment and improving the quality of instruction in primary and secondary schools. Schooling has been associated with:

-transformations of belief systems favouring the acquisition of rationalistic, empirical attitudes conducive to participation in modern institutions of production and governance;

-profound cognitive changes linked to the development of skills in using written language;

-involvement in the market economy, increased earnings and higher levels of productivity in agriculture and wage employment; and,

-lower fertility, good nutritional practices and better health.

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The correlation of schooling with various social and economic outcomes was for many years supportive of quantitative expansion of education particularly at the primary level, and indifference to its implications for instruction. Recent evidence of the variability of outcome responses has led to a concern for reducing the variability of school inputs to facilitate retention and boast achievement, thereby increasing the efficiency of educational investments. (Heyneman and White 1986)

At least four sets of explanations have been offered for the impact of schooling which draw attention to different features of school experiences. The first places importance on the social organization of schooling, its similarity to complex organizations of production, and to the affective changes that may result that, in turn, are held to be responsible for social change. This explanation developed from the "structuralist" tradition in contemporary North American sociology. More specifically, it is derived from the research of modernization theorists whose concern was to describe the relationship between social institutions and social change in a way that would account for the evolution of new forms of social relations in response to the penetration of colonialism, capitalism and machine based modes of production into non-western agrarian societies. The western school transplanted to Africa and Asia by European colonial officials and missionaries seemed to many modernization theorists to be an important source of new attitudes and behaviours and, thus, an accelerator of social change. It involved new experiences, preparing individuals to enter a society based on employment, income and participation in networks of social relations that have little to do with the affiliations

of kinship.

A second identifies literacy (and numeracy) acquired through secular schooling as stimuli for cognitive changes that enable individuals to process a wide range of scientific and technological information. At the centre of this explanation are assumptions about the relationship between language and thought, between instruction and cognition and, more importantly, about the knowledge and skills that are required to make use of products and processes of modern science and technology in daily life. Schooling is presented as an institution that exposes pupils to novel cognitive tasks having meaning in the context of an economic system facilitating widespread access to products of modern science and technology in which participation necessitates use of printed information and self instruction. Cognitive skills learned incidental to becoming literate in school but associated with the processing of written text, are the subjects of investigation. Literacy is presumed to enhance an individual's capacity to benefit from goods and services linked to contemporary notions of a better life. Such explanations of school effects are strongly influenced by recent reformulations of the works of Luria, Vygotsky and other Soviet psychologists.

A third explanation gives emphasis to the training and socializing functions of schooling and to the value added to an individual's productive skills. Education is viewed as analogous to land, labour and capital, i.e. as a factor of production generative of wealth and also the means by which the social relations of production are reproduced as well as transformed. Human capital theory is the most ideologically accommodating and perhaps for this reason, the dominant expression of this

perspective. The first uses of human capital theory focused on assessing the contribution of qualitative improvement of the labour force through increase in schooling to economic growth, making few assumptions about how schooling might improve productive skills.

Subsequent refinements to human capital theory made individual investment decisions the object of analysis and enabled comparisons between alternative educational investments. The labour market established the value of schooling principally in the form of earnings received. Increments in lifetime earnings could be attributed to amounts and kinds of education and, presupposing that earnings measure productive skills, benefits to individuals could be calculated and assumed to represent those accruing to society. Abilities to use technology and methods of production that increase the efficiency of productive resources are believed to be impacted by the school curriculum as well as by the social organization of instruction. What is learned especially from what is formally taught is considered an intermediate effect on employment and, ultimately, on earnings. This will vary with length and quality of instruction, and with the correspondance between the content of schooling and the kinds of training and experiences that are valued in the labour market. The key issues have to do with school factors co-related with the mastery and retention of knowledge and basic skills, effective job search strategies, employment and differential earnings. The social skills implicated in non-farm, non-household production for which schooling has been viewed as preparation, such as capacities to work co-operatively and independently, are more difficult to

study. Nonetheless, they are considered important in accounting for effects of schooling on the development of productive capacities.

The fourth explanation stresses the impact of schooling on status aspirations and consumption patterns. Reference is made to the social discontinuities created by schooling which is central to its function as Margaret Mead it, once put it, of turning "the child of the peasant into a clerk, of the farmer into a lawyer.....of the illiterate into the literate." (Mead 1943, 639). Intergenerational changes in social roles arise from the historical connection between schooling and wage employment and the monetary economy, more generally. Schooling exposes pupils to a wide range of social and occupational roles, notable among them, positions of public trust and responsibility within the school system which afford a standard of living that is enviable in rural areas in many developing countries. This results, it is argued, in a scramble for educational credentials that are the means of entry into formal employment. Formal employment, in turn, provides the wherewithal to satisfy the expectations schooling generates; disposable income to purchase consumables including medicine, modern health care, nutritious food and better education for children. What schooling imparts, in brief, are not only notions of a better life but the means through which this can be achieved, educationally as well as in terms of the social conditions that facilitate satisfaction of material aspirations. Perhaps the most important of these are residence in an urban area where a greater variety of consumer goods, health, educational and social services are available, as well as the nuclear family together with the adoption of

fertility control technologies to reduce family size. Although the importance of social and material betterment is taught in a formal sense it is the examples that schooling provides that are perhaps most influential.

Plan of Study

These explanations for the effects of schooling implicate the school curricula, literacy, the organization of instruction, and the articulation of schooling with the wage and monetary economy as some of the mechanisms through which individuals are changed and benefits to society occur. Most research on school outcomes employs at least one of these explanations, usually more than one, to account for measurable changes in individual behaviour or for aggregate social benefits.

The literature that will be reviewed has been divided into four sections corresponding to different domains of school outcomes. The first comprises studies of the modernizing effects of schooling. Though most studies have examined the attitudes of students, their principal findings have permeated thinking about how schooling might influence adult behaviour. The second reviews research on effects of school acquired literacy and numeracy on cognition. Literacy and numeracy are treated as outcomes rather than, simply, intermediate effects because they may change behaviour in ways that enhance capacities to satisfy basic social and material needs. The third and fourth sections survey research on the relationship between schooling and employment, earnings, productivity and such benefits as improved health and nutrition and fertility control. Deriving these benefits from schooling is, however, determined by many factors

including those related to sex and ethnicity as well as to how societies are organized for achieving political ends.

Wide variations in the extent to which capacities acquired through schooling are realized in satisfying aspirations for a better life are concealed when individual benefits are aggregated. Female cultivators, for example, may not realize benefits from primary schooling if they do not have disposable income with which they can purchase medicines to reduce infant mortality or agricultural chemicals that may raise their productivity, even if schooling has made them more capable of using products and processes of modern science. Moreover, a useful distinction may be made between school effects that may be discernable at an individual level that are essentially attitudinal and cognitive, and the instrumental benefits to society with which they are intuitively associated Although these are usually combined in the rationale educational research has developed for investing in schooling, it is important to recognize that studies which have established the powerful effects of schooling on psychological functioning can only suggest what social benefits might result. Similarly, benefits which have been attributed to schooling do not indicate how individuals have been changed by their school experiences.

The domains surveyed are essentially those considered in an influential study of the external efficiency of school investments prepared for the World Bank by Colclough who argued for increased investment in primary education. (Colclough 1980) Many of the sources Colclough reviewed are re-analyzed and the findings brought up to date. This essay does not take issue with the proposition that familial and public resources should be

directed to the expansion of primary schooling in developing countries. That issue was decided long before researchers expressed interest in determining whether this was the most efficient use of educational resources. School enrollments in developing countries have greatly increased at the primary level and many of them are near providing universal primary education. (Patel 1985) What may have been achieved is considered in subsequent discussion.

How schooling is to be provided, for how long, in what forms, to whom, at whose cost are decisions that must be based on criteria of efficiency and effectiveness and informed by research. Evaluations of external efficiency of schooling usually seek to provide support for the high priority education receives in development planning or for prioritizing investment in different levels of schooling. This is most obvious in the use of rate of return analysis to asses educational investments. But it is also apparent in other approaches to evaluation that assume schooling to be an input differentiated mainly interms of level and type of instruction to be correlated with outcome attitudes and behaviour of policy interest. An important consequence is that quantitative expansion of schooling has been stressed in educational planning notwithstanding qualitative evidence of diminishing school effectiveness measured by student achievement scores (Heyneman and White, 1986).

Perscriptions for educational investment have often not taken into account their impact on conditions of instruction because the mechanisms through which school experiences are transformed into school outcomes are still poorly understood. What is needed, it will be argued, are approaches to assessing

school outcomes that offer insights into how competencies are developed in school as well as into how school acquired knowledge and skills are used in daily life. In brief, assessments of the external efficiency of educational investments must also inform decisions that affect what happens at school; decisions about programs of instruction; class sizes, preservice and in-service teacher training, the subjects of instruction and examination, textbook distribution, methods of assessment and other issues that are at the centre of educational policy.

## Schooling and the Modernization of "Traditional" Societies

When colonial societies were becoming independent in the 1950s and early 1960s, there was a great deal of concern about the future of the newly implanted participatory political institutions which metropolitan countries created. Economic growth was considered a necessary but not a sufficient condition for political stability. The influence of modern political and economic institutions now extended to populations largely untouched by colonial administration. The lessons drawn from the first decade of independence, especially from the highly publicized turmoil that the Congo experienced, seemed to many North Americans and Europeans to reinforce the colonial wisdom that schooling prepared countries for responsible self-governance and increased living standards. "The argument that education would change the level of individual psychological functioning to make possible changes in economic and political activity," note the authors of a recent reassessment of early research in cross-cultural psychology, "fit perfectly with long-standing

American beliefs in the importance of a well-educated population to the proper functioning of a democracy." (Dias et al. 1986, 1050)

The educational implications of modernization theory are associated with the writings of Inkeles who endeavoured to construct a psychometric profile of the "modernity syndrome." (Inkeles and Smith 1974) The profile was developed for two purposes, first, to determine whether there were attitudes, values and behaviours that characterized modernization in individuals, and, second, to examine sources of influence on the acquisition of these attributes. Inkeles' universalistic conception of modernity developed from his observation that structures of production and governance as well as those which allocate individuals to social and occupational roles are "stable" across industrial cultures though their institutional form and ideological premises may vary greatly. Stability is also observable in how individuals relate to these structures. The modernity syndrome presumes a graduated set of responses to modern institutions and influences ranging from affirmation of customary pre-industrial beliefs ("tradition") to the adoption of values of instrumental importance in modern society that may be in conflict with those inherited from previous generations. In much of the Third World, modernity is associated with the integration of pre-capitalist, agrarian societies into a world economic system whose origins are to be found in the economic and social transformations that took place in Europe and North America in the 19th and 20th centuries. Hence, the ethos to which Inkeles refers is rooted in Weber's psycho-social interpretations of the social changes which capitalism and the

rise of the secular state expressed. (Weber 1947)

Individual Modernity

Inkeles' modernity syndrome was operationalized as responses to a set of interrelated scales measuring attitudes towards new technologies and experiences, independence from familial and communal authority and allegiance to institutions of secular authority, faith in western science, values relating to social mobility, beliefs about control of the future, interest in civic and political affairs, and cosmopolitan concerns with events outside the realm of family, community and kinship group. (Inkeles 1966, 1973a, Inkeles and Smith 1974) Responses to more than 180 questions were aggregated into an Overall Modernity score. (Smith and Inkeles 1966) A score of 100 could be achieved by the "most modern men" by responses that, for example, indicated a knowledge of and, presumably, readiness to use contraceptives, disagreement with the proposition that children should always obey their parents, or willingness to protest a bad government proposal. (Inkeles 1976) A "traditional" man would be likely to know little of birth control, place importance on child obedience and accept governmental proposals as being beyond his ability to influence. Although the content of the statements and questions used to elicit individual modernity was adapted to have cultural pertinence, the psycho-social attributes measured were assumed to have similar meaning, cross-culturally. In other words the attitudes, values and knowledge of the modern world that characterize modernity in, say, Tunisia, have relevance for other countries in terms of their underlying traits, predispositions and beliefs. Despite persistent criticism of the

ethnocentricity of the concept of individual modernity (Portes 1973) and the acknowledged weaknesses of psychometric approaches to the study of social processes (Godwin 1974), it is important for the insight it affords into the affective changes schooling may bring about.

Modernization research sought to connect school experiences to the development of capacities having to do with the ways individuals work, interact with complex institutions and make use of secular, scientific knowledge in daily life. Researchers were content with measuring these capacities with instruments that elicited attitudes whose connection to the behaviours they represented was inferred. Still, attitudinal transformations have some intuitive relationship to why investments are made in schooling. Such transformations are central to the rhetoric of school syllabi in many developing countries especially in socialist countries which are usually less reticent about promoting social change, though society rather than individuals is the object of these transformations. Affective changes attributed to schooling may not predispose people to do things differently, be sufficient for changes in behaviour to occur, nor indicate competencies they may not have otherwise possessed or developed. But schooling is a powerful social experience, influencing how individuals think about themselves in ways that are valued in various development idealogies and presumed to result in new capacities.

## Comparative Studies of Individual Modernity

Many studies were carried out using the Overall Modernity scale in the 1960s and early 1970s in countries as diverse as

Argentina, Brazil, Chile, India, Israel, Nigeria, and the United States. Modifications of the scale are still used in educational research on many topics ranging from studies of the impact of schooling on receptivity to science popularization programs to the application of school knowledge and skills in peasant agriculture. (See, for example, Tiku 1985 and Jamison and Moock 1984)

The initial administrations of the modernization scale with national samples of (mostly male) adolescents and adults with less than eight years of schooling in Argentina, Chile, Bangladesh, India, Israel and Nigeria established that each year of schooling increased modernity scores by slightly less than two percent. (Inkeles and Smith 1966) Compared to other modernizing influences such as urbanization, factory experience and exposure to mass media, the effects of schooling were more profound and more consistent across the various national data sets. Later administrations (see, for example, Holsinger, Klineberg, Sack, Susman 1973) confirmed the strong independent effects of schooling on modernity scores, and some like Holsinger's study of Brazilian adults attributed even larger effects, particularly to primary education. (Holsinger 1973; Holsinger and Theisen 1977)

Holsinger's study is perhaps the most methodologically convincing of the modernization studies as his findings fo school effects do not conceal the possible influence of maturity and socio-economic background, and data was also collected from school children over a five month period showing substantial rise in scores between administrations. (Holsinger and Theisen 1977) How much schooling is necessary to bring about a shift from tradition to modernity? The answer, of course, depends on the

beliefs and values a child enters school with and are acquired from and reinforced by the home environment, though there is some evidence that the effects of schooling are more pronounced for children from more disadvantaged, and, thus, supposedly more "traditional" backgrounds. (Holsinger 1973) It depends also on the modernity of the school environment and the school curricula as well as on intellectual capacity of the child to integrate new information and experiences. Most of the studies of schooled adults in non-western countries with low incomes suggest that substantial affective change requires relatively high levels of schooling, i.e. at least a complete primary education. Adults with seven or fewer years of schooling achieved scores clustering around the mid point in the modernity scale. (e.g. Sack 1973) A full secondary education generally raised scores to the upper third of the scale, high enough to be unambiguous evidence of modernity. At what point additional schooling would have diminishing effects on modernity is unclear. (Holsinger and Theisen 1977, Cunningham 1973, 219).

## Structural Explanations of School Effects

Modernization theory presented secular schooling as an agency of "deliberate change" in an industrial society imparting "attitudinal orientations for a changing social structure." (Moore 1965, 110) Moore drew attention to three features of the formal structure of the modern school which were the antecedents of new attitudes and values: the curriculum, especially its sequential organization; the allocation of rewards based on competitive performance; and, more significantly, the inculcation of problem solving skills. "Schools," he emphasized, "contribute

to the creation and direction of social change in addition to transmitting the cultural heritage." (Moore 1965, 111) Inkeles speculated that the effects of schooling on affective modernity were incidental to the formal learning of core subjects such as history, geography, civics and science which transmit modern knowledge. When items eliciting school knowledge of these subjects were omitted from the Overall Modernity Scale, "education still showed as a substantial independent cause of individual modernity." (Inkeles 1973b, 175) Consequently, while modern knowledge might facilitate or enhance the acquisition of modern attitudes, it was the organization of learning in schools that provided opportunities to think and behave in modern ways.

Inkeles identified four processes associated with school learning as being crucial to the explanation of school effects: reward and punishment, modeling, exemplification and generalization. Reward and punishment is mentioned in connection with the socialization of children into the sequential routines that are a part of classroom life, and of modern society by implication. According to Inkeles, such experiences teach the principle of planning. The contact of children with figures of authority within the school, particularly with teachers, leads to imitative behaviour involving the expression of modern values and forms of conduct like receptivity to new ideas, impartiality and co-operation. The school in exemplifying these values and behaviours encourages their acceptance. Generalization is emphasized in connection with the development of personal efficiency through mastery of school skills. This increases the individual's sense of personal capacity, control and willingness to learn, experiment with and acquire new skills. These

processes operate within institutions where: 1) knowledge is imparted by persons who are presumed to be competent to instruct on the basis of previous formal training; 2) learning activities are organized in terms of sequential, hierarchical tasks; 3) instruction is segmented to foster mastery; 4) mastery is assessed with respect to universalistic criteria; and 5) authority relations are based on demonstrations of ability.

Dreeben's On What is Learned in Schools (1968) offers an insightful analysis of the relationship between activities characteristic of school instruction and the incidental learning of social norms intuitively associated with individual modernity. Schooling affords, he observed, an opportunity to become socially competent with respect to what is required to function in the context of complex organizations of production. While Inkeles considered the school's structure in relation to processes of socialization and attitudinal outcomes, Dreeben described the content of school socialization in terms of the learning of norms guiding behaviours that are significant in later life from the methods as well as from the circumstances of formal instruction. Norms of independence (working independently and accepting responsibility for one's actions), achievement (valuing mastery of school knowledge and adoption of strategies to secure rewards associated with mastery), universalism (capacity to act co-operatively in groups) and specificity (respect for non-familial authority and ability to interact with others according to their discrete characteristics) are imbedded not only in school routines but in the way knowledge is transmitted. For instance, universalism may be learned from student project work which is important especially in instruction in academic

subjects at the primary level. Or, homework assignments may be viewed in this perspective as a device for teaching independence. One strength of Dreeben's analysis is that it encourages distinctions to be made among levels and subjects of instruction as to the norms that may be prominent in the methods selected for instruction. At the primary level, for example, emphasis may be placed on universalism and specificity whereas achievement may receive greater attention in secondary schools. Academic subjects may be more appropriate for learning independence and achievement than technical subjects.

Modernity research was not conceived so that these and related hypotheses could be examined directly. That would have involved a much more detailed characterization of the educational experiences of school leavers than psychometric and survey approaches allow, and more explicit treatments of the connection between the content and processes of social learning at school and the attitudinal and behaviour outcomes under investigation. However, some studies do provide disparate insights into the gross effects of different educational experiences and characteristics of instruction on individual modernity.

Program Outcomes

The modernizing effects of academic and vocational and technical education were examined in several studies. Evidence of the importance of the instructional program which a student undertakes is provided by Armer and Youtz in their study of modernity among Muslims in Northern Nigeria where comparisons between secular and Koranic education established the modernizing effects of government schooling and also indicated

the importance of academic instruction of the kind offered in secondary grammar schools. (Armer and Youtz 1971, 620) Individuals with similar levels of schooling who attended teacher training colleges or technical institutions were less likely to score highly on measures of modernity. Because of selective recruitment into the various types of post primary institutions, these results could be attributed to "intelligence" and other predisposing factors. The curriculum seems to be implicated in these differences notwithstanding selection bias. The lower scores of schooled adults with more exposure to Koranic education points to this and, in light of the reliance on recitation in religious education, to the importance of "problem solving" methods of instruction in academic subjects.

Sack's study of the contribution of vocational training to modernity in Tunisia also suggests that its effects are negligible though he attributed his findings to the limited duration of such instruction ("eleven months (is) not enough to impart ... modernizing values") rather than to its methods or content. (Sack 1973, 269) Recent studies comparing the modernity scores of students in academic and prevocational programs in Columbia and Tanzania reach a different conclusion. Vocational training is more modernizing. (Psaropoulos and Loxley 1985) It may be tentatively concluded that the interaction between subject and method of instruction may account for some of the differential effects of schooling in modernizing attitudes, although how and under what circumstances is still unclear.

## Effects of Achievement and School Environment

The relationship of formal knowledge and scholastic

performance to modernity is crucial to an understanding of whether it is the structure or the content and associated processes of instruction that are responsible for affective change. Unfortunately, the findings on this issue are ambiguous. As noted earlier, when Inkeles deleted information items from the modernity inventory, the correlation between years of schooling and modern attitudes was unaffected. Moreover, when Holsinger compared increases in modernity scores with information test scores of Brazilian primary school students, he found that while annual knowledge gains were slightly larger (7.1 vs. 5.1), "the school does nearly as well at its subconscious, informal and implicit task of modernizing as it does in meeting its explicity stated task of imparting certain kinds of knowledge." (Holsinger, 1973, 193) Other studies show a high correlation between modernity and graded academic performance. (for example, Cunningham 1973) Grades measure mastery of school knowledge as well as social competence (valuing mastery and acting accordingly). In an interesting analysis of teacher assessments of a student's initiative, ambition, desire to learn, responsibility and leadership, Cunningham demonstrated that these correlated more highly with the grade point average of Puerto Rican secondary school students than with their modernity scores.

Few studies have investigated the effects of the school environment on modernity despite the fact that schooling is central to an explanation of how individuals in traditional societies become modern. Among the exceptions are Holsinger's Brazilian study to which reference has been made above, and Susman's survey of Black migrants to Boston. (Susman 1973) Inkeles recognized that school characteristics could enhance or

limit its socializing effects. Unless the school environment exemplified modern values and self-consciously fostered their acquisition in children, affective change might not be discernible --- or might, in extreme cases, contribute to rejecting these orientations. If a pupil's school experience, Inkeles noted, is "one of continuous frustration, failure and rejection, (then) insofar as this pupil generalizes from his school experience ... it will hardly be by way of feeling more efficacious or more open to new experience." (Inkeles 1973b, 178) While Susman's survey of American Blacks did not indicate that school quality (principally school location) was of much importance in accounting for variance in modernity scores, this could be attributed to the greater degree of uniformity in school conditions and resources in developed countries. In developing countries, differences in school quality are more pronounced. (Heynemen 1983)

In Brazil, Holsinger showed that modernity scores were variable across classrooms at the same grade level. In one of the classrooms studied, pupil's modernity scores actually declined between administrations of the survey instruments while others increased by an average of more than five points. (Holsinger 1977, 193) Holsinger does not present an explanation of this anomaly. In a subsequent study, he examined the effects of teacher modernity, physical environment, teacher negativism, sociometric structure and classroom climate on pupils' modernity. (Holsinger 1976) A combination of the five indicators of school quality was found to be "a substantially better predictor of both Modernity and more traditionally tested achievement items than...Socio Economic Status." (Holsinger and Theisen 1977, 324)

However, the aggregation of qualitative factors as disparate as these into a single measure makes it difficult to draw meaningful implications.

An important weakness of the modernity research is that it offers little more than speculation as to the causes of affective change in the school environment. Significantly, the modernizing characteristics of schooling are substantiated with North American theories and examples. How much personal efficacy is fostered, for instance, in primary school systems in many developing countries in which wastage may account for a fourth to a half of the entering cohort, and in which less than a third of those surviving until the terminal year of primary schooling are likely to gain admission to secondary schools? What opportunities do students in impoverished rural schools have to develop independence, responsibility, or initiative when there are few textbooks for them to study from, and achievement is determined by performance on national examinations set with reference to a national syllabus that teachers have difficulty in covering?

It is possible to accept the claims made in the modernity studies for the effectiveness of schooling without correlative explanations founded upon generalizations from developed to developing countries. Schooling in developing countries may indeed teach personal efficacy and other modern values but in very different ways. Simply attending school on a fairly regular basis is a demonstration of personal efficacy in many countries. The term "school leaver" which is commonly used in African countries and refers to attendance without stigmatizing the individual as a failure or dropout, has connotations of

achievement as well as of personal efficacy. Similarly, independence may be less often learned through planned opportunities for self study than through necessity. Large class sizes often in excess of fifty children per classroom at the primary level, the examination orientation of instruction and parental pressures to succeed academically may be a more powerful influence on the development of independent behaviours. In brief, the features of schools in developing countries that modernize students may not be those associated with the functioning of modern institutions in developed countries.

## The Cognitive Consequences of Literacy and Numeracy

In a recent review of literacy research, Kaestle remarked that while much is known about how literacy developed in modern western countries and there has been much speculation about its contribution to social and economic changes in these countries, much less is known about the uses of literacy in everyday life that may facilitate the transformation of societies. (Kaestle 1985, 45) Instead, debate has necessarily centered on association between rates of individual literacy and historical changes in the organization of production, 18th and 19th century Europe and North America serving to illustrate what may be achieved in contemporary developing countries by making primary schooling universal and eradicating illiteracy through adult education programs. The lessons that can be extracted from the western experience are not supportive. Economic growth seems to have preceeded rather than to have coincided with the expansion of literacy. (Stone 1969) In fact, some historians have

suggested that industrialization which is usually associated with literacy actually depressed literacy rates, and slowed the development of primary education because it required child labour. (Sanderson 1972) The contribution of literacy to an agricultural revolution in the late 18th century and to an industrial revolution in the mid 19th century is, of course, difficult to assess in the absence of better evidence of literacy than signature studies can provide. Whether literacy and the cognitive and social skills acquired incidental to learning to read and write enhanced the capacity of individuals to utilize machine based technologies of production cannot be determined retrospectively. What is clear, though, is that an increasing proportion of the population of Europe and North America were becoming literate through schooling at the time that important, lasting changes were taking place in methods of production which accelerated capital accumulation and stratified societies, internally and internationally. (Oxenham 1980)

Almost twenty-five years ago Bowman and Anderson postulated that a 40% literacy rate might be a threshold level for high rates of economic growth in developing countries. (Bowman and Anderson 1963) It is often forgotten that this prescription which was invoked in support of the universalization of primary education and the organization of literacy campaigns in developing countries in the 1960s was accompanied by a warning that these measures were no panacea for economic growth Public education, literacy and the introduction of new technologies of production form a complex ecology the individual elements of which could not be interjected in the expectation that substantial economic change would result. In sum, the

educational "gap" between developed and developing countries could be narrowed without appreciably narrowing the differences among societies in levels of material prosperity.

Today levels of educational attainment in Third World countries are approaching the historical position of western Europe in the 1950s attesting to the enormous expansion of primary and secondary educacion especially in Latin America and Asia. (Patel 1985) But except perhaps in the so-called newly industrialized countries (for example, Thailand, Taiwan, Korea and Hong Kong), this has not been accompanied by a proportional increase in living standards. (Hicks 1980) The historical connection between literacy and the satisfaction of basic material needs that is assumed in the rhetoric of educational expansion in developing countries particularly in Africa is increasingly less convincing in the light of significant school leaver unemployment, declining per capita agricultural production and endemic poverty. Such evidence is, however, no more informative that the inferences that have been made from the historical experience of developed countries in the absence of a better knowledge of what changes in individual capacities accompany the acquisition of literacy, and of what uses individuals make of literacy acquired from schooling and from other sources.

## Cognitive Consequences of Literacy

Early correlational studies such as Bowman and Anderson's used schooling to measure literacy levels, and literacy to explain the influence of schooling. The school's efficacy in imparting literacy, and the long term retention of literacy were

assumed without serious scrutiny in the belief that the associated cognitive skills were permanent. Goody and Watt in an influential essay on the social changes resulting from mass literacy, made an important distinction between the intellectual operations which literacy enabled and those that were permissible in ordinary speech. (Goody and Watt 1963) Comprehension and production of written text, they said, required explication of formal logical structures --- specification of relationships between events, for instance --- that in speech could be imputed or implied from knowledge external to the frame of discourse. Written language thus fosters different kinds of reasoning. Development of alphabetic systems, Goody and Watt speculated, facilitates intellectual discovery and cultural innovation particularly where literacy is widespread. Literacy and numeracy are considered basic to functioning in a modern society. Numeracy, the ability to perform arithmetic operations, differs from literacy in the sense that comprehension and production tasks are analytically identical. But like literacy, numeracy requires that symbolic knowledge be integrated into formal structures for purposes of comprehension and production.

The impact of modernization on cognition was investigated by the Soviet psychologist Luria who studied nomadic and peasant societies in Central Asia which varied in their response to collectivization schemes that transformed traditional production and permitted extension of schooling into areas previously resistant to schooling and to other "modern" influences. Luria examined the reasoning of individuals who were affected by collectivization and compared them to those who were not. He "found striking differences in the way these two populations

responded to verbal syllogisms." (Cole et al 1971, 185) His studies proposed that patterns of cognition could be changed by a powerful combination of modern influences, technology, new forms of production, literacy and schooling.

John Gay, who collaborated with Michael Cole in a study of the Kpelle society of Liberia, examined the effects of schooling on problem solving strategies. (Gay and Cole 1967) He compared unschooled to schooled Kpelle and both groups to American high school students. The performance of schooled Kpelle was similar to American students on experimental tasks thought to involve "universal" cognitive skills. Kpelle who had not been to school had difficulty in sorting and classifying familiar objects and did poorly on verbal tasks measuring more complex skills in inferential reasoning. However, Gay doubted that these findings were evidence of the cognitive deficits that the term illiteracy may imply. Unschooled Kpelle agriculturalists used complex cognitive processes in solving a wide range of problems which were meaningful to them, in estimating weight and value of agricultural produce, for instance. They performed poorly on school-like tasks that were presented as hypothetical problems the solution to which necessitated an ability to infer rules from individual cases, a mode of reasoning that unschooled Kpelle were hesitant to employ at least in experimental situations.

In later research, Cole established that "moderate levels of education led to performance that American research has found to be characteristic of a higher development level." (Cole et al 1971, 224) Moderate education, the completion of two to six years of schooling, increased skills in discriminant learning and in solving word problems. Although Cole's earlier studies

suggested an experiential explanation for the development of different intellectual structures and processes for integrating knowledge, it was now unclear whether the tasks characteristic of school instruction facilitated the cognitive changes observed, or whether these were incidental to literacy.

Formal and Informal Acquisition of Literacy Skills

A major five year research project was begun in 1973 to study the cognitive effects of various ways of acquiring literacy among the Vai of Liberia, a Muslim society and one of the few in Africa to have evolved a script for an indigenous language. Vai speakers were of special interest because they may become literate in English in school, in Arabic in Koranic school or in Vai as a result of self-initiated, informal learning. Analyses of performance related to categorization, memory, logical reasoning, encoding and decoding, semantic integration and verbal explanation indicated that "literacy is not a surrogate for schooling with respect to its intellectual consequences." (Scribner and Cole 1981, 252) English schooling "enhanced" performance on almost all outcome measures except those which modeled tasks associated with Vai and Arabic script learning such as incremental recall. The effects of English schooling were most apparent in tests of verbal explanation including facility in communicating information and solving syllogisms. "We have no reason to believe," Scribner and Cole observe, "that skills required to explain why these problems were answered in a certain way are fostered by knowledge of a written language..." "Rather," it is concluded, "they strike us as being exactly those skills that are acquired in a teacher-pupil dialogue in the

classroom." (Scribner and Cole 1981, 255) Rather oddly, Scribner and Cole invoke the findings of micro-ethnographies of teacher-student dialogue in American classrooms to substantiate their speculation that skills in verbal explanation are acquired in explanatory learning tasks which are a prominent feature of instruction: "What made you give that answer?, How do you know?," etc. That such dialogue is a prominent feature of classroom instruction in Liberia is not established.

The distinction made between literacy and school effects in Cole's most recent research is of considerable importance in light of the findings from studies of cognitive skill retention among school leavers. (Dias et al 1986) These have cast doubt upon the long term effects of even substantial school instruction on retention of literacy and numeracy skills. Retention studies are difficult to carry out for many reasons. Literacy and numeracy are not easily defined in terms of performance measures that are meaningful insofar as the cognitive requirements of daily life are concerned. Moreover, retention should be studied longitudinally; but this is seldom possible. Consequently, cross-sectional approaches are used in which comparisons are drawn between the performance levels of students and school leavers. An example is Simmons' study of Tunisian urban workers. About half of Simmons' sample who were presumably literate in French and Arabic when they left school had lapsed into illiteracy or semi-literacy after about five years, i.e. tney were unable to read or understand a national newspaper. Almost the same proportion could not do simple arithmetic operations involving multiplication and division. (Simmons 1976, 86)

Scribner and Cole's subjects who had been to government or

Koranic school were not tested for literacy. Self-reported literacy sufficed as a criterion for the assignment of subjects to literacy groups. There is no way of knowing what proportion of schooled Kpelle might be "functionally" illiterate or semi-literate as Simmons' defined these terms. However, it is likely that the proportion is very high given the fact that Scribner and Cole's study population covered a much wider age range (from less than twenty years to fifty years and older compared to ages fifteen to twenty-five), and was composed mainly of individuals residing in towns and villages in rural areas where literacy skills are less apt to be a part of daily life. (Scribner and Cole 1981, 292-4, Simmons 1976, 90) The cognitive effects of schooling may be more enduring than the literacy and numeracy skills which schools transmit if these effects are understood in a broader sense in terms of cognitive strategies and processes which may be generated by formal instruction.

## Measuring Literacy

In most educational research, literacy has been considered to be, quite simply, the ability to recall and integrate factual information from a written text that a school child should be capable of understanding. Tasks created to assess comprehension of written texts in test situations typically combine factual recall with the text present with "problem- solving" exercises requiring the assembly of new information into syllogisms. The tasks are assumed to be nominally equivalent for individuals of similar age and educational experience. The strength of this approach is its simplicity and ability to differentiate the school age population in terms of skills that have an intuitive

relationship to instruction and examination and are, in fact, highly correlated with school achievement. Its chief weakness is that the text comprehension tasks may have little to do with literate performance that is meaningful to most people including school children.

Elsewhere I have shown that comprehension of written texts is influenced by the student's familiarity with the subject of the text as well as with the instruction he has received in interpreting similar texts. (Eisemon 1987) A comparison of primary school age children in coastal Kenya who had completed a madrassa education with other Muslim children attending government schools with little exposure to traditional religious instruction indicated not only that madrassa graduates excelled in recall tasks with religious texts but that they performed better than other children in the comprehension of material taught in science classes requiring high level inferences from the texts or from prior knowledge. The superior performance of madrassa graduates was attributed to more frequent exposure to printed information and to the emphasis placed in religious learning on drawing ethical applications from principles, developing skills which may be transferred to other domains. Similar findings are reported by Wagner whose studies of Koranic education in North Africa suggest that it has a positive influence on later schooling. (Wagner 1986) These findings contradict the assumption that school acquired literacy necessarily promotes "problem solving" skills irrespective of the circumstances of instruction. Children who lacked a religious education which fosters a disciplined study of texts and who became literate only at school experienced great difficulties in

doing what schooling is supposed to teach children to do; to apply principles derived from science and related subjects to tasks of importance to them in daily life. Although such tasks might be meaningful in a practical sense, they may have little importance in teaching which is oriented to preparing children to recall information required for national examinations.

Literacy Retention

The problem of nominal equivalence of literary tasks is particularly acute with respect to the assessment of literacy retention among adults. Simmon's study of Tunisian urban workers, which has been mentioned above, used sixth grade students as the control group for measuring literacy losses. In other words, text and tasks that were comprehensible to these students should be understood by adults who had left school after completing sixth grade. School control groups have been used for many studies of literacy retention, and five or six years of primary education seems to be the base line adopted in most of them. (Hartley and Swanson 1984, 33-37) Some studies have attempted to differentiate retention by year of schooling. An International Development Research Centre project in the Philippines, for example, measured retention of basic skills by testing achievement in English, Philippino and mathematics in each grade level, and comparing individuals who left school to grade specific norms. (EDPITAF 1980) Not surprisingly, a higher proportion of adults who terminated schooling after one year were "illiterate" than those who continued to the third grade. A majority of primary school leavers were found to have "lost" skills. (Hartley and Swanson 1984, 36)

Interestingly, numeracy skills were more apt to decline than comprehension and production skills in the mother tongue or in a foreign language. The findings that skill loss decreases with number of years of schooling and that numeracy skills are more easily lost are corroberated in other investigations. (For example, Roy and Kapoor 1975, Sheffield 1977) While there is no agreement in these studies as to how much schooling or adult literacy instruction is needed to make literacy permanent, speculation centres on four to six years of schooling, slightly less in the case of adult literacy programs. (Hartley and Swanson 1984, 26-37)

More recent research has challenged the notion of a threshold level beyond which literacy becomes permanent. In a study of Egyptian primary school dropouts and students attending school, Hartley and Swanson have suggested that the "striking flatness of the (literacy) retention curves and the fact that the curves of dropouts from lower grades actually rise renders moot most arguments concerning threshold levels." "Rather than lapsing into illiteracy," they argue, "the children with the lowest level of skills are likely to build upon the few skills they have mastered in school." (Hartley and Swanson 1984, 5) The authors propose that four years of primary schooling is needed to make an individual "functionally literate" in the opinion of Egyptian educators. (Hartley and Swanson 1984, 6) An important feature of Hartley and Swanson's analysis is that the lower skill levels of dropouts were taken into consideration. Thus, they lost less literacy than is commonly supposed because they exhibited less competence in literacy tasks while in school. Among the factors which showed the strongest relationship to

skill retention were the individual's health status and parental socio-economic status. School variables "were relatively less important" though level of teacher-training and good school facilities had some positive effect. (Hartley and Swanson 1984, 11) But like previous studies of literacy retention, no effort was made to connect performance measures to observed instructional experiences or to determine their relevance to adult literates.

In three studies of uses of literacy in daily life, I have suggested that retention rates may be higher than is often assumed due to the fact that adult literates process written text differently than school children especially if the subject matter is familiar and meaningful. Two studies carried out in coastal and western Kenya among adults with at least six years of primary schooling examined skills in comprehending commercial instructions on the use of pharmaceutical products and agricultural chemicals. (Eisemon 1987, Eisemon and Nyamete 1987) In contrast to school children, adults perform poorly on comprehension tasks assessing facility in recalling factual information from the text. They are, however, more likely to use prior knowledge --- much of it acquired in school--- to comprehend written text. Although adult literates were found to read English, Kiswahili and mother tongue text with little difficulty, and to recall school acquired knowledge of mathematics, science, health science and agriculture needed to comprehend the texts, they often did not make correct inferences. School acquired literacy did not make them functionally literate if they did not understand what they were taught in school. Schooling imparts basic skills but not necessarily an

understanding of concepts that are required for their successful application. This was traced to instructional methods selected for their suitability for large classes, limited learning resources and the preparation of students for national examinations which develop a knowledge of scientific and technical vocabulary without much understanding of the principles and processes involved. (Eisemon, Patel and Abage forthcoming) The small number of subjects did not permit an analysis of the loss of skills over time among individuals with different levels of schooling. Nor was it possible to estimate how much schooling was required to comprehend commercial instructions though individuals with two or more years of secondary education generally performed better. Preliminary findings from a related study of Maasai mothers' comprehension of instructions for oral rehydration therapy indicate a similar pattern. A relatively high level of schooling is necessary to impart basic understandings of biological and physical processes that are assumed in the safe and effective use of this treatment. Again, some secondary education seems to be a pre-requisite for truly functional literacy. (Eisemon, Patel and Ole Sena 1987)

To recapitulate, school acquired literacy has been linked to important social and economic changes in societies as well as to changes in cognition at the individual level. The contribution of literacy to economic growth remains unclear. About the most that can be said is that a highly literate, well schooled population is a typical outcome if not a precondition for industrialization, and that the skills involved in manipulating alphabetic and numerical symbols and carrying out intellectual operations with them may facilitate use of processes and products

of modern science and technology where these skills have been developed in conjunction with the learning of an appropriate knowledge base. In comparison to other modes of literacy acquisition, formal schooling has been found to be more effective in imparting higher level skills in inferential and explanatory reasoning though this may vary with the methods and conditions of instruction.

Efforts to study the retention and use of literacy skills have suffered from a lack of accepted definitions of literacy, agreement as to what level of facility enables literacy to become a permanent, self-sustaining skill, or as to what constitutes functional abilities. These difficulties may in large part be due to notions of literacy that equate comprehension and production of written language with basic skills which can be analyzed without an understanding of the circumstances of their acquisition and the contextual features of their use. (Street 1984) Recent evidence suggests that more literacy may be retained and used than previously thought but that the benefits literacy is thought to confer in terms of facilitating behaviours associated with a better life may not be realized without high levels of schooling and a great deal of modern knowledge.

## Economic Benefits of Educational Investments

Estimating the economic benefits of educational investments has been the principal object of studies intending to assess the external productivity of school systems, and doing this has involved calculating rates of returns to such investments based on data on individual earnings. The theory of rate of return

analysis assumes earnings to measure productivity and earnings functions to be an individual's equilibrium price. An individual will continue to invest in schooling as long as earnings benefits (private return) exceed returns to alternative investments. Rates of return to society's investments in schooling (social return) are projected from earnings functions on the assumption that increased earnings attributable to incremental increases in levels of schooling are redistributed through differential taxation and public expenditures producing social benefits. A third measure is being developed to better assess the benefits accruing from government investments in schooling which take into account the opportunity costs of student subsidies and other direct income transfers. This measure, the fiscal rate of return, "views investment from the point of view of the government, rather than society as a whole." (Psacharopoulos and Woodhall 1985, 139-140) Its use in a recent study of higher education in Chile, strengthened recommendations to reduce government subsidies and introduce cost recovery measures in order to bring private rates of return into line with the usually lower benefits to government and to society. For a more thorough discussion of rate of return models, see Blaug (1967), Thias and Carnoy (1972), Psacharopoulos (1975, 1980 and 1985) and Psacharopoulos and Woodhall (1985).

Increasing Productive Capacities

School related increases in earnings are explained by the contribution of education to the acquisition of vocational skills and knowledge including "reasoning skills (and) changes in beliefs and values and in attitudes toward work and society."

(World Bank 1980, 47) Such skills, knowledge, beliefs, values and attitudes raise the productive capacities of the labour force by enabling more efficient use of production technologies and physical capital, generally. The value thus added to an individual's capacities is viewed as fairly uniform for levels of educational attainment and as stable or to increase at a constant rate over the individual's productive life varying with capacities possessed upon entry into the labour market. The contribution of education to more efficient utilization of all factors of production is acknowledged in the form of higher incomes and, in the case of wage salary employment, in the practice of remunerating workers according to their levels of schooling. Both are seen to measure the relative productivity of labour inputs. The evidence adduced in support of the proposition that schooling increases productive capacity and, hence, economic growth uses qualitative improvement of the labour force to count for most unaccounted for growth (Schultz 1961, 1963, [illegible]n 1962), or seeks to explain the proportion of variation in national growth rates that can be assigned to the level of human resource development (Hicks 1980), or to measure how much additional output is created by combining investment in physical capital with investments in education. (Wheeler 1980; Marris 1982)

The importance of schooling has also been emphasized in connection with its contribution to the success of development strategies that alleviate poverty while fostering economic growth. Widespread access to schooling and high levels of school attainent have been identified as preconditions for the export led, open, labour intensive growth in newly industrialing

countries like South Korea with equitable patterns of income distribution. In the Korean case, major investments which the country made in expanding its educational infrastructure in the decade 1953-1963 enabled it to develop important comparative advantages in labour skills which permitted the 1964-73 expansion of export industries producing labour intensive non-durable consumer goods. (Adelman and Robinson 1978; 41-7, 199-200). This was accomplished in the context of measures introduced to raise real incomes, especially of the rural poor, by increasing commodity prices, and of major investments in technological modernization of agriculture whose success may also be attributed in some part to the increase of schooling among the rural population. (Jamison and Lau 1982)

Rate of Return Analysis

Since the early 1970s rate of return analysis has been employed by the World Bank to guide its educational lending to developing countries, and commended to planners as an instrument for evaluating individual projects, the distribution of subsidies within the educational system, the profitability of allocations to education compared with other sectoral expenditures as well as a base for extrapolating the future impact of present patterns of investment.

While these analyses do not reveal very much about how schooling might increase productivity, or about the conditions that maximize use of school acquired knowledge, skills and affective dispositions, they do create a compelling argument in favour of increased investment in education. In addition, rate of return analyses provide a normative data on patterns of

educational expenditure indicating how a country ought to make investments within the educational system among levels and programs. It directs attention to sources of social inequalities and to corrective measures. High private rates of return to public investments especially in secondary and higher education suggest - besides the adoption of cost recovery measures (higher tuition fees, the substitution of loan schemes for direct subsidies, etc.), more comprehensive, more effective and more progressive taxation of income. It casts judicious doubt on the efficacy of "supply side" solutions to manpower shortages by emphasizing the rationality of individual investment decisions. Even in economies in which the public sector is the predominent employer and where some variant of manpower planning is practiced, little will be accomplished in correcting aggregate or geographical shortages of skill labour by expanding opportunities for training without commensurate changes in the remuneration associated with occupations deemed to be critical for national development. Finally, it promotes concern for the quality of preparation individuals receive for entry into occupations as well as for structural imperfections in the labour market that create chronic disequilibrium in the production and demand for skilled labour.

The findings of international comparisons of rates of return to educational investments are well-known:

"1. The returns to primary education (whether social or private) are highest among all educational levels.

2. The private returns are in excess of social returns, especially at the university level.

3. All rates of return to investment in education are well above

the 10 percent yardstick commonly used by developing countries to indicate the opportunity cost of capital.

4. The returns to education in developing countries are higher than the corresponding returns in more advanced countries," (Psacharopoulos and Woodhall 1985, 55)

5. The economic benefits of educating women are generally higher than for men. (Psacharopoulos 1985)

While these findings have been presented as having importance for investment decision making they have been perhaps more influential in providing substantiation to the belief that educational investments in neo-capitalist economies disproportionately subsidize the economically well off segments of the population who are the most likely to receive the limited opportunities for secondary and higher education.

As an instrument for guiding educational decision making at the national level, rate of return analyses have been criticized for producing rather vague prescriptions for resource allocation apart from priority investment in primary and female education. However, present applications of the technique involving examination of the profitability of alternative investments using earnings data collected from tracer studies increase its utility as a decision making tool. This is a major improvement on previous analyses aggregating costs and income benefits across levels of education which, especially in developing countries, vary enormously in the range of their objectives and in their articulation with the so-called modern sector of the economy. In addition, explicit attention is now given to qualitative outcomes of different programs of study to take into account variations in ability among graduates entering the labour market with different

qualifications.

Investing in Academic and Vocational Education

Two recent studies of Psacharopoulos and Loxley are of special importance in this connection. (Psacharopoulos and Loxley 1985) Conducted in Columbia and Tanzania, the studies compare academic secondary education with diversified secondary education in which students are exposed to prevocational subjects. The programs were compared with respect to the social background of students, their performance on examinations measuring academic and vocational knowledge, their propensity to continue formal education, and their employment and initial earnings on graduation. Estimates of the social rates of return to investments in academic and diversified secondary education indicate that the latter are not "significantly more or less profitable as an investment." (Psacharopoulos and Woodhall 1985) The high costs of prevocational training in both countries, the narrow range of public sector salaries for secondary school graduates of all types in Tanzania, and the very wide range in income among Columbian graduates which reduced differences in mean earnings were among the factors cited as responsible for the similar rates of return. (Psacharopoulos and Loxley 1985, 210-228)

Interestingly, performance on tests of vocational knowledge was influenced not only by the amount of instruction but also in Tanzania, by when the school introduced vocational training; the earlier it was begun the higher the level of student performance. Although data on the interrelationship of measures of (verbal and mathematical) aptitude, achievement, employment and earnings were

not presented for Tanzania, the Columbian study indicated that "no one factor, even academic achievement, was shown to have a significant effect on earnings." (Psacharopoulos and Loxley 1985, 109) The employment and earnings data from which this finding is derived is incomplete and limited to information obtained in 1982 from 1981 graduates. Yet it is of considerable importance inasmuch as the effects of schooling on earnings are hypothesized to represent differences in productivity based on skills and knowledge developed through instruction which are the basis for allocating further education and of allocating jobs and income as well. Inferences made about the value added to productive capacities by increments of schooling are founded on the notion that progression from one stage of education to the next is determined by demonstrations of ability that have some relationship to work. These may need to be re-examined if it is consistently shown that ability has little to do with the explanation of differences in economic benefits obtained from further study.

## Education and Income Differentials

Why do employers raise levels of educational qualifications required for employment and pay individuals accordingly if these practices do not recognize differences in productive ability? Several controversial explanations have been proposed focusing on the signalling (Spence 1973) and screening (Arrow 1973) functions of schooling for the labour market. Expressed perhaps too simply, such explanations propose that employers overvalue schooling by using it to sort out individuals for employment rather than to reward productive skills. A variant of this

explanation proposes that employers reward social skills that are associated with increasing levels of schooling but may have no obvious relationship to production or to even the social competencies involved with work in complex organisations. Strong objections to the sorting hypothesis have been expressed by Psacharopoulos who claims that there is little evidence that employers continue paying wages above a worker's productivity after an initial period of observation. (Psacharopoulos and Woodhall, 1985, 45) However, his studies provide little support for the alternative ability hypothesis though the absence of longitudinal data on earnings makes any conclusion tentative.

Simmon's 1974 study of sources of income differentials among Tunisian blue collar workers revealed that earnings had more relationship to work experience than to schooling and that while literacy was associated with income it did not explain much of the variance in earnings. (Simmons 1974) The study is significant because individuals in the occupations examined possessed a wide range of educational credentials. Comparisons of earnings differentials across occupations are not particularly insightful in as much as the effects of schooling are confounded with the relationship between schooling and occupational recruitment. Simmon's instruments incorporated crude measures of cognitive skills employed at work (e.g. Did they read and write on the job?). "With the exception of the variable 'reads newspapers'," Simmons concludes, "the use, or the ability to use, school skills outside the factory is not related to earnings." (Simmons 1974, 8) Although the supporting evidence is weak, Simmon's findings indicate that the proposition that schooling increases in earnings after initial employment needs to be tested

with occupations which are fluid with respect to the educational qualifications needed for entry. (Heyneman 1984) In most developing countries, particularly those in which a large share of the labour force is employed in the private sector, there is considerble variation in earnings differentials among workers across occupational categories. In Bogota, for example, the ratio of income received by workers in sales jobs with higher education to that obtained by persons with no schooling is 11:1 compared to 4:1 in production and 5:1 in technical occupations. (Fields 1980, 50) Moreover, the variation in income ratios between well schooled and unschooled workers across industries is even greater; 25:1 in agriculture, 11:1 in retail trade, etc. (Fields 1980, 52) In other words, even if earnings differentials actually measure productivity, the influence of schooling is so varied for individuals with similar qualifications that it is probably necessary to first specify its effects for particular occupations and industries, and then examine their antecedents in particular kinds of instructional experiences and learning outcomes.

The latter will require development of measures of knowledge and skills that have functional validity not only with respect to what students are expected to know and do at the end of a program of studies but also in relation to what is required of them in occupations and work settings where they are likely to find employment. Some part, possibly a very large part, of the knowledge and skills acquired at school is transferrable from one domain of work to another and rewarded differentially. But even literacy skills are not as generalizeable within domains of instruction as educators previously thought. (Bloome 1986) Nor

are they apt to be uniformly applicable to different forms of work involving literacy. An association between schooling, literacy skills and earnings will not tell us much about the kinds of instruction employers value when they hire and increase the earnings of school literates, and what should be done to better prepare students for the labour market. Skills and knowledge gained incidental to becoming literate in school may be even more important.

The screening hypothesis gives schools an influential role in the development of social competence that machine based methods of production and socially diverse productive organizations require. Conjecture as to the nature of these skills has centred on behaviours which have to do with skills in interacting with non-familial authority. (Bowles and Gintis 1976) It is difficult to accept the implication that authority relations skills are better learned in school than on the job, or that they have a linear relationship to levels of schooling. There may be other social skills which are essentially cognitive that are much more complex and more likely to be learned from formal instruction. A survey of highly remunerated factory occupations in western Kenya which do not require literacy, numeracy or school knowledge for performance, revealed most positions were filled by school leavers despite employers' preferences for unschooled workers. (Eisemon 1986) Ethnographic analysis of these occupations established that what was common to all of them was that job performance depended on meticulous compliance with sequential work procedures. An extreme example are positions connected with the preparation of quarry sites for blasting, and those which involved regular maintenance of heavy

machinery. Workers in these occupations did not use school knowledge and skills in any formal sense. They did, however, perform complex school-like procedural tasks. Attempts to measure related cognitive skills in comprehending procedural information among school children demonstrated that length of primary schooling was associated with competence. In short, the relationship between schooling, employment and occupational performance may be more subtle than the association of indicators of education, occupational status and earnings suggests.

## Limitations of Rate of Return Analyses

Many objections have been raised against the use of rate of return analyses to estimate individual or social benefits accruing from educational investments. Some have been addressed by improvements in the quality of data. Attempts have been made, for example, to control for ability in selection to academic and technical secondary education and to take account of the impact of educational expansion on unemployment. The findings of recent studies strengthen previous claims. For example, an Indonesian comparison of academic with vocational education established higher returns to academic instruction fo ale, urban graduates even under assumptions of higher, temporary unemployment. (Clark 1983, 46) Some are inherently difficult to address in any satisfactory way. Rate of return analyses equate costs with benefits at the time data were collected and even sophisticated extrapolations based on time series data may provide a poor indication of what returns might be in the future after major educational investments have been made. This objection applies, of course, to any strategy of rationalizing and planning

investment.

A more serious objection is that in light of the constraints on obtaining comprehensive data on individual earnings, rates of return are almost always calculated with income estimates for individuals employed in the formal sector of the economies of developing countries. Not only are the "incomes" of individuals (especially women) in the subsistence sector usually ignored, but the earnings of educated workers in the non-agricultural informal sector in rural and urban areas are seldom estimated with precision largely because of the assumption that workers have only one occupation from which they obtain income. (King 1977) A recent household survey of informal sector employment in a rural area in Western Kenya revealed that most workers combine participation in peasant agriculture with many forms of casual and sometimes permanent employment. (Shiundu 1986) The majority of rural primary school leavers and many secondary school graduates in Kenya have little opportunity for permanent employment and enter the loosely defined informal sector where the value placed on educational credentials has perhaps a closer relationship to productivity than in the government dominated formal sector which is the object of development planning. Informal sector earnings may not be as low as is often thought. (ILO 1972) The average combined earnings of individuals who were described as being self-employed in this survey were well above the estimated average earnings of urban skilled workers.

While Kenya is atypical of African countries in having a relatively high level of prosperity in rural areas enabling a development of a large informal sector (accounting for, in the district studied, about 30% of adult employment), similar

situations can be found in other parts of the developing world. The rapidly expanding informal sector greatly limits the use of conventional income estimates in rate of return analyses. Moreover, in many developing countries with incomes policies that reduce earnings differentials between skilled and unskilled workers in the public sector, income estimates for the formal sector are becoming increasingly unreliable. An undetermined but probably very high proportion of public sector workers in countries like Ghana and Tanzania, for example, hold several jobs simultaneously and/or use their formal employment to generate informal income. Advocates of rate of return analysis recognize the biases in earnings estimated from government sources and have attempted to correct them in sample surveys to the extent that more comprehensive self reporting of income is requested. (Heyneman 1984) Objections about the quality and interpretation of earnings data are countered with the contention that individual benefits to schooling would probably be greater if income could be better estimated. How social benefits would be affected is more difficult to determine.

## Impact of Schooling on Production

Evidence relating to the impact of schooling on physical output is more convincing than uses of income estimates to measure productivity. Unfortunately, there is very little evidence of school effects on industrial output where comparisons between workers in similar jobs with different levels of education are possible. Factory level studies tend to place importance on work experience as the major factor affecting worker's earnings as well as output. (e.g. Fuller 1975)

However, the findings of these studies are usually oriented to testing of the screening hypothesis rather than to an examination of the use or lack of use of school knowledge and skills. (For a summary, see Berry in T. King 1980, 201-202)

Several studies summarized by Rathgeber have investigated the use of school acquired craft skills in the formal and informal sectors. (Rathgeber 1986; Shiudu 1986; Ndua 1985; Oyerieye 1980) These have shown that few worker use vocational skills taught to them in schools; vocational skills are generally acquired on-the-job usually through apprenticeship, and whether individuals make use of formal or informal vocational training is strongly influenced by factors unrelated to their training such as the availability of capital. The teaching of pre-vocational and vocational skills has been severely criticized. Schools often lack the necessary equipment "which would have provided (students) the opportunity to develop some manual skills." (Rathgeber 1986, 9) Comparisons of the acquisition of craft skills in and outside school have also drawn attention to the complex tasks associated with competence in craft production, and to the difficulties in acquiring important skills through formal instruction. A recent study of instruction in soapstone carving in primary schools and in families of soapstone carvers in western Kenya, for instance, indicated that high level skills in plastic representation are developed through spontaneous learning experiences involving careful observation of demonstrations of competent task performance. (Eisemon, Hart and Ongesa 1987) Such experiences are rarely possible in school. Moveover, while school instruction in craft skills is predicated upon a linear development of skills, progression from one level to the next

being dependent upon factors other than individual task competence, outside school processes of skill acquisition are less linear and hierarchial but more rigid in the sequence of activities that contribute to competence. In contrast to school children who develop skills in producing objects of little cr no economic value in the belief that these skills are somehow generalizable, children learning crafts outside school are producing objects for sale with scarce materials and valuable tools. This has serious implications for whether children acquire skills in efficient use of materials, skills that may be fundamental to successful self-employment especially in cottage industries and kinds of artisan production which are important in rural areas.

Education and Agricultural Productivity

More supportive, more insightful evidence of the productivity-raising effects of schooling is to be found in the literature on education and agricultural productivity. (Lockheed et al 1980; Jamison and Lau 1982; Jamison and Moock 1984) A number of studies summarized by Lockheed, Jamison and Lau (1980) correlate schooling with what are represented as significant increases in the value of crop production. In eighteen developing country studies, farmers with some primary education (four or more years) produced almost 13% more crops than farmers who had not been to school when non-skill inputs affecting crop production were controlled. (Jamison and Lau in Psacharopoulos and Woodhall 1985, 46) The effects of schooling on agricultural productivity, especially in an investigation of the crop production practices of farmers in Thailand, seem to be mediated

by choice of and skill in using production technologies. (Jamison and Lau 1982, 195-222) For example, each year of schooling was estimated to raise output by 2% and 3% if chemical fertilizers were applied. (Jamison and Lau 1982, 10) Similar estimates of productivity increases per year of schooling were obtained for Korea although comparisons of mechanized and non-mechanized farms did not, for reasons which are largely unexplained, indicate a stronger impact of education on productivity under technology intensive conditions. In many of the studies reviewed by Jamison, Lockheed and Lau, four years of schooling of the "head of the household" is considered to be a threshold for productivity effects. The head of the household is in most of the countries studied likely to be male while in at least some of them ---Kenya, for instance---the cultivators responsible for selecting and using modern production technologies, though perhaps not for purchasing them, are apt to be women who usually have lower levels of schooling.

The more recent data from Korea suggests that when the educational level of all adult members of the household is taken into account, school effects on efficient use of production technologies and higher agricultural output may be greater. (Jamison and Lau 1982) But this varies from country to country. The educational level of households in Thailand is not related to productivity on farms using chemical fertilizers. (Jamison and Lau 1982, 131) What these findings emphasize is the importance of linking estimates of school effects to qualitative information to the sexual and generation division of labour in peasant agriculture, and to household decision making regarding selection of production technologies.

Risto Harma has proposed a model describing how formal schooling may increase agricultural productivity. On the basis of interviews with extension officers and observations of farmer "entrepreneurs" in Latin America, Harma identified four stages of agricultural productivity and the knowledge and skill requirements associated with each stage. At the first level, traditional farming involving use of local varieties and technologies, some elements of numeracy are required: minimally, addition and subtraction. (as reported by Heyneman in Habte et al 1983, 16). At the highest level of agricultural technology which is associated with the use of high yielding varieties, fertilizer, tubewells and irrigation, reading comprehension and written communication are necessary as is knowledge of concepts of elementary chemistry, biology, physics and the ability to interpret as well as to make use of new information. These cognitive requirements roughly approximate the academic content and socio-economic objectives set for primary education in developing countries most of which have for many years given primary schooling a practical orientation suited to modern agriculture.

Two studies can be considered to be tests of Harma's model, and their findings are not encouraging. The first comprised a review of research to determine whether literacy influenced the adoption of modern farm practices (Villaume 1977). Data from India and Brazil were used to construct a model to assess the contribution of schooling and literacy to agricultural innovation. The findings indicated that the direct and indirect effects of schooling and literacy were negligible in comparison to size of land holdings and income, "a clear indication of the

necessity of considering socio-economic opportunity in explaining adoption (of agricultural innovations)." (Villaume 1977, viii) Non-formal learning, involvement in agricultural extension programs, for example, had more impact than schooling. The second, a study of the effects of farmer education on farm efficiency in Nepal, concludes with the observation that neither literacy nor measures of agricultural knowledge are highly associated with technological adoption or agricultural output. (Jamison and Moock 1984) Numeracy was found to have a positive effect on productivity but only for the use of fertilizer and the production of wheat.

Notwithstanding the weak evidence of effects of measures of school knowledge and skills in raising agricultural productivity, the rates of return to rural education have been estimated for Korea, Malaysia and Thailand to range from 10-26% depending on prices for farm products and the time when benefits are assumed to begin. (Jamison and Lau 1982, 225) The apparent contradiction may say more about the way in which literacy, numeracy and retention of agricultural knowledge are studied than about their effects on agricultural production. How school knowledge and skills are integrated into agricultural practice is a very complex topic that does not easily lend itself to survey research. Experimental studies of the effects of schooling on the comprehension of instructions on the use of agricultural chemicals, indicate that literacy and school knowledge influence the safe and appropriate use of these products, and that misuse accounts in part for the large variation in yields on peasant plots as well as for the high incidence of chemical poisoning in rural areas. (Eisemon 1987; Eisemon and Nyamete 1987)

## Effects of Education on Fertility and Health

Correlations between schooling and lower fertility, lower infant mortality and better child nutrition have been reported in many countries. Excellent reviews of this literature can be found in several World Bank publications; in Colclough (1980), Cochrane (1979; 1980) and O'Hara (1979), for instance. Because most of the primary studies employ bivariate or multivariate analyses, the interpretation of results focuses on the linearity, direction and magnitude of relationships between schooling, health and other social welfare measures. Although smaller families, healthier mothers and children and longer life expectancy are usually viewed as important externalities of educational investments, research on these topics does not easily lend itself to deriving formulations relating to, say, the increase in life expectancy that will accrue from an additional year of schooling. Compared to the effects of other development investments that improve living conditions, school effects are usually much smaller and strengthen the influence of more significant factors such as access to health and social services. (Moock and Leslie, 1985) Cochrane's two reviews of research in these fields, which present a comprehensive analysis of the sources of school effects, will be drawn upon in subsequent discussion. The reviews are especially important as the explanations offered for school influences make reference to those which have been mentioned earlier and direct attention to the affective changes brought about by the social organization of schooling, the psycho-social impact of school acquired literacy, and the aspirations generated among school leavers for paid employment and a better life that is more often available in the

urban, formal sector of developing economies.

Education and Fertility

Cochrane's 1979 review of research on fertility identifies three channels through which education affects fertility; namely, through changing the supply of and demand for children and use of medical technologies which regulate the incidence of pregnancy. (Cochrane 1979, 7-9) Schooling affects the biological supply of children by encouraging women to marry and have their first child later, thereby reducing the span of their child bearing years. However, schooling may also make a direct contribution to increasing fertility by nourishing and looking after the basic health requirements of students, and in the long run raising the health status of parents and infants. Subsidized distribution of milk and food at school, government boarding schools, compulsory immunization of school age children, provision of free health services in school, and so on, have obvious importance for the nutritional status of children, the control of debilitating and life-threatening communicable diseases and, thus, for female fertility. Although Cochrane did not review research on the impact of these measures, it is likely that expansion of access to primary schooling together with the use of schools as informal health care delivery systems has appreciably influenced both health (Levinger 1986) and fertility. Much of the increase in life expectancy and population growth rates in the colonial period has been attributed to the introduction of western medicine and modern nutritional practices through missionary schooling. (e.g. Halley 1957, 138-143) These direct health inputs have significant indirect effects as well. Malnutrition has been

associated with student wastage (Hartley and Swanson 1985) and with low achievement. (Selowsky 1976; Jamison et al 1984)

A related explanation of the positive impact of schooling on "biological supply" has to do with outcomes of science and health education programs in primary schools which impart knowledge of better nutrition and personal and public hygiene that is communicated to students, their parents and to subsequent offspring. This is implied in Cochrane's analysis but not explicated, nor do the studies she surveyed offer any indication as to the retention and use of skills and knowledge acquired from such instruction in improving family health.

A third way schooling may increase student health and nutrition thereby affecting fertility is through informal social learning of better personal hygiene, for instance. Autobiographical accounts of colonial education frequently stress the importance which schools gave to the learning and practicing of western notions of good diet and proper hygiene. (Laye 1954) There is some evidence that this is still done in government and private boarding schools. (Masseman 1972; Ole Sena 1986) There is also evidence that this kind of social learning has become less important as day schooling facilities have increased and as the professionalization of teaching in developing countries has focused concern on text based domains of knowledge. (Abagi 1985; Eisemon, Patel and Ole Sena 1986).

Schooling decreases "biological supply" in more straightforward ways. Men and women who attend school for long periods of time marry later, have children later, and have "more choices about their lives (affecting) their decisions to marry and at what age." (Cochrane 1979, 98) These effects are clearly

influenced by school characteristics and policies and are reinforced by local customs relating to dowry or bride prices. Moreover, in many developing countries, as is the case in a large number of western countries, marriage and schooling represent exclusive choices at least up to the compulsory school leaving age or to the age at which free, "universal" schooling is provided. This applies even more strongly to continuing schooling and having children. Women who become pregnant at school are often compelled to leave school at least for the duration of their pregnancy and often for good. (Eisemon 1987) Since a number of developing countries make provision for single sex secondary education and/or support boarding schools, women's exposure to pregnancy is minimized. The impact of these practices on lifetime fertility can only be conjectured. Evidence of the direct effects of schooling on fertility are rather ambiguous. (Cochrane 1979, 99) Insofar as females of secondary school age are concerned, evidence of lower fertility among women in school does not necessarily imply lower lifetime fertility. The positive effects of education on reducing the span of child bearing seem to be cancelled out by, among other things, changing attitudes toward post-partum abstinence and prolonged breast feeding and by greater likelihood of conception and infant survival due to other effects of schooling.

Another channel through which education affects fertility relates to its influence on the demand for children. (Cochrane 1979, 100-113) Here the evidence is somewhat less ambiguous. "Education," Cochrane concludes, "is inversely related to ideal family size." (Cochrane 1979, 114) Education is related to perceived ability to afford children but also, not surprisingly,

to "higher perceived costs of (having) children." (Cochrane 1979, 115) How education affects the ability to afford children has been considered in the previous section; schooling increases the propensity for wage/salary employment. Thus, it effects are primarily expressed, Wheeler concludes in a study of income, population and female education in eleven countries, in "the degree to which the society has already made significant investments in education." (Wheeler 1984, 162)

How education affects perceptions of the costs of having children is another matter. Several studies Cochrane reviewed indicated that educated, employed women, especially in high income households, were more sensitive to the costs of having a large number of children. (e.g. Chang 1976, Birdsall and Cochrane 1982) Schooling has an important indirect role to play in this as well. Schooling increases desires for further education for the recipient and for his or her offspring, and may also increase desires for higher quality education. In many developing countries, pre-primary education, schooling beyond the secondary level, higher education and quality education at all levels -- typically access to instruction in a metropolitan language which has been adopted for secondary and/or higher education -- is offered in the private sector or is only partly subsidized by government. Though the associated costs are widely recognized as substantial and to increase with the obligation to educate all children to a level that their ability and the family's financial means allow, the impact of these costs on desired family size or on the actual number of children of schooled parents remains to be systematically investigated.

The third channel is through the effects of schooling on

attitudes toward, knowledge about and the practice of birth control. (Cochrane 1979, 116-140) The studies considered by Cochrane show that "education increases contraceptive knowledge in a stronger and more uniform manner than it improves attitudes toward contraception...Education increases contraceptive use, but this relation is slightly less uniform that that for contraceptive knowledge." (Cochrane 1979, 139-140) The effects of education on contraceptive knowledge cannot be simply attributed to school instruction, nor are they in the studies of Korea and a number of Latin American countries which Cochrane selects for detailed analysis. Schooled men and women of child raising age are more apt to have access to a wide variety of sources of information about contraception from printed and other media, and more exposure to health clinics and adult education programs.

Reproduction is, however, taught in primary and secondary schools in many developing countries. Its effects on the acquisition of knowledge relevant to contraception, like the effects of instruction in health and nutrition, are seldom evaluated either in the context of formal assessment of student achievement in biology or in fertility studies except in reference to the number of birth control techniques an educated individual has heard of.

Yet the knowledge and skills schooling imparts may be very crucial to the successful use of contraceptive techniques. Although relatively safe reversible birth control techniques are available for women (and men), less safe and irreversible techniques such as injection and sterilization are favoured by family planners and foreign donors for developing countries for

reasons having to do with perceptions of their suitability for poorly educated or uneducated rural populations (Eisemon 1986) Self administration of birth control pills, for example, is a more complex task than it is often assumed to be. Some understanding of how the pills act to control fertility is required as is confidence in pills as a treatment modality. The strong relationship between secondary and higher education and contraceptive use --- 50% to 100% higher than for women with only primary education --- may have less to do with intervening variables such as urban residence, husband's education and family income than with a threshold level of basic scientific knowledge relevant to health and contraception. (Cochrane 1979, 12o-129) Unless more is learned about the effects of instruction on fertility beliefs and practices, explanations of school effects will continue to emphasize intermediate outcomes providing only modest support for the long term social benefits of increasing access to education and raising levels of educational attainment, and will be of little practical guidance to educators or educational policy makers. This is a weakness of research on the effects of schooling on health as well.

## Effects of Education on Health

A major review of research on the effects of education on health edited by Susan Cochrane (1980) takes a similar approach to theorizing about the causes of the strong relationship observed between parental education and mortality and life expectancy. The association of education with better health is stronger and more consistent than the link between education and fertility. "An additional year of schooling for a mother," it is

claimed, "results in a reduction of 9 per 1,000 in the mortality of her offspring," for instance. (Cochrane 1980, 92) Husband's education produces a much smaller effect; less than half. While these findings are supportive of efforts to educate women and keep them in school longer, they have few other implications.

O'Hara's model of the effects of education on health which is presented in this review identifies two channels through which schooling influences health: first, education increases participation in the monetary economy, and some of the income thus obtained is used to purchase food, housing, and medical care; second, schooling provides individuals with the knowledge and skills to efficiently utilize medical services and other resources that improve health. (O'Hara in Cochrane 1980, 35; Cochrane, Leslie and O'Hara 1982) Elaborating on the possible effects of health instruction O'Hara comments:

> Different kinds of education may of course operate through these channels in different proportions. A knowledge of diesel engine repair would presumably operate through high income, while training in home economics is designed to operate through non-market activity. The latter, however, usually includes some coursework dealing with health, which presumably should be especially effective in increasing health though non-market channels. (O'Hara 1980, 35-36)

In a footnote to this observation, O'Hara expresses regret that "for policy purposes, this presumption can scarcely be tested using the existing literature because information on type or content of education is rarely available in conjunction with health data." (O'Hara 1980, 36) Indeed, the model he proposes for analyzing the household "production" of health includes measures of parental levels of education, income, and expenditures and no measures of the amount of instruction

received on health and related topics, or the knowledge or skills developed and retained from such instruction. Commenting on the findings of studies correlating schooling with improved health, Grosse cautions that "there is as yet little evidence that changes in policies with respect to health bring about changes in health status or even that changes in the amount or distribution of education result in health status changes. "We need to know more," he adds, "about what kinds of education (in specific settings) affect health and to what extent. Are people better off if the focus is on school attendence - and what dimensions - time, attainment, etc.?" (Grosse 1982, 105-106).

Studies of mothers' acceptance of primary health care interventions have indicated that while school instruction seems to influence beliefs about the causation and treatment of children's illnesses, it usually does not produce understanding that is presumed in the use of modern medicines or in the adoption of nutritional and other practices associated with better health. (Eisemon, Patel and Ole Sena 1987; Eisemon and Patel forthcoming) Even mothers with high level of schooling who have participated in adult health education programs have difficulties in performing seemingly simple procedures involved, for instance, in the administration of oral rehydration salts solutions. Mothers with complete secondary education are often unable to explain why the solutions are necessary and effective and sometimes combine this treatment with other harmful measures such as administering traditional purgatives and discontinuing feeding. School instruction was found to be an important source of confusion about effective treatment of diarrhoeal dehydration.

Two studies have examined how school experiences can be

organized to facilitate learning of health knowledge relevant to changing health practices. Both deal with instruction in diarrhoeal diseases. The first showed that "knowledge about prevention, appropriate treatment, and need for referral in cases of diarrhoea can be effectively passed on from authors (of action oriented health lessons) to health centre staff, to teachers, and then to parents and neighbours." (Rodhe and Sadjimin 1980, 1351). The second correlated changes in methodes of assessment used in Kenyan primary schools with explanatory instruction in health science and better student understanding of the causes and treatment of diarrhoeal dehydration in infants. (Eisemon, Patel and Abagi, forthcoming). The findings of these studies suggest that the effects of schooling on health can be strengthened if the process through which school knowledge and skills influence health practices is better understood.

## Summary and Conclusions

This review was undertaken for the purpose of identifying important outcomes of schooling and what is necessary to achieve them. What have we learned? Superficially, a great deal.

1. Schooling may foster the adoption of modern values and beliefs changing perceptions of self and society. A fairly large amount of schooling seems to be required to produce desired altitudinal changes, however.

2. School literacy fosters profound cognitive changes in the ability to employ and manipulate formal logical structures in reasoning with and from printed texts. Literacy skills developed through formal, secular instruction are not lost when an individual leaves school but the level of mastery of these skills in school will influence competence in literacy tasks in later life.

3. Schooling may increase productive capacities, equipping individuals with skills valued in wage/salary employment and related to the production of foodstuffs with products and processes of modern technology. Productivity increases are greater for those with at least primary education.

Instruction in academic subjects may be more effective than prevocational training insofar as employment and measures of productivity are concerned.

4. School participation improves health and lowers fertility mainly through strengthening the effects of other factors associated with schooling. High rates of school participation and relatively high levels of educational attainment are associated with significant reductions in fertility and infant mortality and increases in life expectancy.

But these findings do not add up to a strategy for optimizing educational investments in poor countries. Important school outcomes have been established. This is the chief contribution of more than twenty years of educational research in developing countries. It is the processes through which these effects occur that now require more careful study.

The most insightful studies of the modernizing effects of schooling indicate that the attitudinal changes with which school experiences are associated can be realized only if the content and methods of instruction support the social changes which they are intended to facilitate. This insight is hidden in the co-relational evidence which has been assembled in favour of the powerful influence of schooling in non-western societies. The processes through which schooling is thought to produce social change presuppose that schools exemplify the idealized features of a modern society. The correspondence between the rationalistic, secular empirical egalitarian values that are represented in educational policy as outcomes of instruction and what takes place in classrooms is crucial to school effectiveness. Modernization research drew attention to the importance of the teacher though it did not establish which kinds of teaching or what teacher characteristics had the most impact on student attitudes. Alarmingly, teacher training was found in

some studies to be among the least "modern" of modernizing educational experiences. Qualitative improvement of teacher training and supervision might increase the school's effectiveness in imparting new values and beliefs, but this must be carried out with a better understanding of who becomes a teacher and how teaching practices are influenced by instructional conditions.

Similiarly, we have learned from studies literacy that the circumstances under which literacy skills are developed and competency obtained largely determines whether they will endure and be useful in adulthood. Formulating policy objectives in terms of providing the number of years of schooling necessary to become literate misses the essential point. Unless children have an opportunity to practice reading in school, and understanding printed texts is made integral to instruction, they are not likely to be literate in any meaningful sense nor are they apt to derive much benefit from being able to read. The implication is that more importance should be given to increasing textbook availability and encouraging teachers and students to use textbooks than to lengthening the primary cycle.

Schooling may enhance productive capacities though it is unclear how this occurs. Instruction in academic subjects perhaps does have more importance for formal as well as informal employment than various forms of prevocational or vocational training. Again, decisions about the length and content of instruction which are not informed by studies of how school knowledge and skills are used in work activities will not produce qualitative improvements in the labour force or make school leavers more employable. There is some evidence that cognitive

skills acquired incidental to school instruction may be more important in agricultural or industrial work involving use of products and processes of modern technology than vocational skills or skills which are usually thought to be developed through instruction in academic subjects.

Investment choices are not as simple as rate of return analyses propose. Most countries do not choose between investing in primary or secondary education or between academic and vocational education on the basis of which investments bring the highest returns. Countries mix investments on the basis of what can be afforded, political pressures for expansion, and projections of manpower needs. Ultimately, decisions are guided by beliefs about the kind of training that will most benefit individuals and society. These are seldom substantiated with any evidence other than what labour surveys might reveal, and conjecture about the utility of schooling inferred from employment and earnings data. What job related skills are best acquired in school? Is formal instruction appropriate for imparting craft skills? What is the role of literacy, numeracy, knowledge of science and other school subjects in the acquisition of technical competence? The answers to such questions have not emerged in the research that has been reviewed nor are they likely to be obtained from studies which do not link estimates of the capacity-increasing effects of schooling to an examination of how the social and technical competence associated with particular kinds of work is developed.

The profound effects of schooling on health and fertility seem supportive of efforts to increase educational attainment especially among females. This is sometimes represented as a

necessary but insufficient condition for increased life expectancy and lower infant mortality and fertility. Nevertheless, there is little evidence that more schooling will increase these effects even if other circumstances are reinforcing. Little is known about how schooling actually effects health and fertility behaviour except in terms of propensities that individuals with certain levels of schooling may have in common. How, for example, does school knowledge influence the way school leavers think about the causes, prevention and treatment of disease? Schooling is important in transmitting modern medical knowledge, specifically, in communicating information about health, nutritional and fertility control practices. And it has a powerful influence on health beliefs and reliance on modern medical care. However, this may not have a lot to do with capacities to use medical knowledge to improve health and child care. How these capacities are developed is crucial to efforts to increase school effects. The way instruction in health and biology is imparted and learning outcomes assessed may have more impact on health status and fertility than either how much is taught or for how long.

While a great deal has been learned about the domains of thought and activity influenced by schooling, the connections to school experiences are quite obscure. Most educational research in developing countries has tended to use input/output models for assessing the effects of instruction on learning and its external efficiency in terms of changes that can be correlated with schooling. To attribute change to school knowledge and skills does not reveal much about what is learned or what is used, or what is necessary for change to occur. Comparison of individuals

with different levels of schooling with respect to important outcomes such as increased farm yields, for instance, may suggest gross school effects but will also reveal large within-group differences that may approach or exceed the between-group differences that are the objects of educational policy. It is indeed remarkable how little descriptive literature exists about schools in any developing country despite the abundance of quantitative information about enrollments, school participation rates, the performance of students on national examinations and international tests of educational achievement, and other subjects. Decisions relating to what length and kinds of instruction are the most efficient uses of scarce human and material resources need to be informed by more detailed analyses of how schooling may contribute to individual and social change.

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