

Work, Education and Scientific and Technological Development Knowledge and Training

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A new facet of the productive structures is the accrued importance of the component "knowledge and training". Indeed, knowledge and training become parts of the productive process from the beginning to its marketing, the traditional vocational training being a limited part of the activities regarding knowledge and transfer inside the working place. At the same time, educational systems come more and more to resemble productive systems; first of all, because their employees are, in many countries, the most relevant part of the working force, secondly, because their "products" are quite often evaluated by the market; thirdly, because part of these educational systems are integrated in the productive system itself. As productive systems, educational systems are facing the same problems as any other productive system: skilling and deskilling, introduction of technologies, explosions, hierarchization, etc.

The education system, as productive system, is influenced by the available technology. For example, in China, the impact of technology on education broadcasting, production of suitable equipment for science education and pilot experiments in the introduction of micro computers in schools.

Three kinds of knowledge seem to be relevant in a

World economy dominated by technological industrialism: (i) technical, scientific and theoretical knowledge... It consists of rationally and systematically structured subjects including not only mathematics and sciences but also environmental, human and systems management studies; (ii) private, sub-cultural or even 'oppositional' knowledge that contains the values of individuals and social groups whose total human needs are not met by economically dominant 'technical' knowledge; (iii) mass-consumption distributed by mass-media².

Comparative Education and the World of Production

New foundations for comparative education and for education itself are needed, and a shift has to be made from the formal educational institutions and legislation to the real emerging needs of society, as far as education is concerned. Comparative education has to become a science of changing societies especially in the field of production, social relations and human values. In this respect, the world of work needs comparative analysis of the developing new education practices, related to the technological and social transformation of production.

There is a discrepancy between the social and economic reality and educational research: some topics, like the international division of labour, the social division of labour or the relations between the crisis of the modern state and education are not a part of the patrimony of educational planners and educators. How is it possible to forecast and to plan educational policies if we are not taking into account these trends of our society?

State, Associative Life and International Organizations

The crisis of the State as an employer and as a responsible body to provide social and educational services has an impact on educational policies and practices. It is not only the State that is in crisis but also other structures at lower and higher levels that provide educational services. I am speaking of the community associative life in various forms on one side, and of international organizations on the other.

The mobility of capital, workers and technologies has an impact on the state's structures. In the peripheral countries the State is appearing in its contradictions: on the one hand, powerful social groups are very often controlling the state machine and the majority of people cannot benefit from the State. But meanwhile, the associative life in the villages and in the urban and suburban setting has more and more difficulty to provide the social and educational services that are needed.

And at a more international level the development of public international structures is very low in comparison with the very strong international technological development. Technological transfers are having influences directly and indirectly on people. Take some examples: a) the migrant worker whose number can be reduced in some sectors of production, and, on the contrary, has increased in other sectors; b) the investment which is often moving from the peripheries to the centres depriving many countries of the necessary capital for their development; c) the polluted industries that are, on the contrary, moving from the centre to the periphery. But all these movements and transfers do not find correspondent international public bodies to regulate them.

Work, Workers and Education

The real and apparent crisis of education has a very negative influence on educational policy makers and on educators' practices and this crisis leads to a lack of strategies and a dangerous separation between the

philosophers and the technologists of education. There is a field where research is needed, and this is that of the relation between work and education. Because of the crisis, because of unemployment, because of the radical transformation of the labour market, there is a kind of consensus in all countries on the need to relate education and work and to combine theoretical and productive activities. Frequently, on this consensus, empty policies are developed of a moralistic nature. For example, early vocationalization of initial training is presented as a solution when it is well known that the new tendencies of the labour market are requiring, on the contrary, workers with communication skills and a broad cultural background, and not only traditional industrial skills.

Workers are not only economic or technological bodies. They are indeed global human beings. Many times they are informed by the newspapers of the "restructuration" of the factories and of the "redundancy" of industrial workers. Their feelings are distress and hopelessness. It is very easy to tell them that new jobs are appearing and that mobility is a necessity in the contemporary world. They feel excluded from the decisions which concern not only professional life but also their families and their own independent time. Work and salary heavily affect social relations.

Technologies, Jobs and Non-Working Time

Information technology industries are growing and in some countries they represent a significant part of the GNP and, more and more, an increasing number of industries are acquiring important components of information technology³. Development of information technology has evident consequences on initial and further training.

If it is true that new technologies are changing the productive system in different countries, this does not mean that all prospective sectors are affected. New sophisticated technologies represent only a limited sector of production. For example, the industry of higher technology in the USA will represent only 3 percent of the global non-agriculture employment and 9 percent of the new employment created between 1982 and 1995. On the contrary, the employment that will develop faster will be those of janitors, cashiers, secretaries, salesmen and employees⁴. Unemployment is not an economic problem only but also a social one. Research is confirming that unemployment has consequences, for example, on the health of the unemployed and of their children⁵.

Unemployment is increasing in nearly all societies. Nevertheless productivity seems to be the goal of productive units as well as of national economic systems. Yet few researchers are work-

ing on the transition period from a working society to a future society when men will be liberated from work⁶.

Radical changes are needed in social and international relations. New values will need to emerge as far as the active and non-active population is concerned. But for the moment nearly nothing is being done for a future management of society where only a limited part of the population will be active in the formal productive process. Why is production considered only in its economic sense? Why are we unable to consider other parts of human activity as production, compulsory or not? There is a tendency to stress only the technological and scientific dimension of the evolution of production; on the contrary a broader cultural approach is needed to understand fully what is happening to man and his productive and creative experience.

Educational and Technological Transfers

Education is becoming more and more relevant in international relations because it is strongly related to the transfer of technologies, training, communication and software.

Powerful countries are using education to create a new impact and exercise greater control on more peripheral ones. International, bilateral and multilateral cooperation in the field of education is growing, but the multilateral cooperation, especially that managed by the United Nations, is facing greater and greater difficulties.

The internationalization of military power has also strong implications on training. It is clear that several nations are influenced in the training of their army by the most powerful countries that are providers of technology and weapons. Technological transactions are a very important dimension of modern trade. Roughly three quarters of technology exchange is between industrialized countries (and more or less three quarters of the investments of industrialized countries go to other industrialized countries, with the exception of Japan where 50 percent of technological exports and foreign investments go to developing countries mostly in Asia⁷).

Have the new technologies contributed to reinforce or to destabilize the peripheral countries? The three myths which, these last years, have constituted - or seem to have constituted - the Third World Power in North-South relations: exploitation, raw material, industrialization and planning, are today in crisis because new technologies have introduced the growth of immaterial production; the development of the tertiary sector and its integration with the industrial sector, and the vanishing of planning, because of the logic of an instantaneous market⁸.

Research and Production

Is research also a facet of production? For some of the most advanced industries and services, yes. Part of their budget and time is invested in research; but still many industries and services have not realized the relevance of research in production and in education.

Research is becoming a vital part of the environment of industries and of services as well as education and training⁹. The extreme dynamics of industrial research means to find an appropriate framework for research within the place of work and within the traditional institutions for research and education. New management is needed for productive activities largely based on research production. This tendency means new directions for research in the place of work and especially in the educational and research institutions.

Industrial expenditure on research and development is very high in multinational enterprises. The share of the multinationals in the total financing of industrial research and development in the OECD countries is approximately 75 per cent. In order to illustrate the extent of this expenditure it is enough to say that SIEMENS puts aside a budget on research and development higher than that for the whole of Swedish industry and almost equal to that of all the Italian enterprises put together¹⁰. But we should not forget that small and medium size industries develop some kind of non-formal applied research too that is not always taken into account by statistics.

Risks and Adventures

It is important to analyze the implications of modern technology on human behaviour. "The cybernetic model suggests that human behaviour is entirely representable in the electronic mode: if we come to believe that it is possible to capture intelligence with artificial devices, then we shall come to believe that

human beings can make their own history, a profoundly totalitarian idea - if we are capable of making history than we have nothing to learn from it... information society is, as it is currently conceived a society incapable of being surprised; except by its own miscalculation"¹¹. Man has a feeling that his autonomous actions, once governed by guess and judgement leaving space for error, have disappeared. We are living in an era of a more perfect market, leading to more perfect knowledge but in an extremely brittle and dangerous world, both economically and militarily¹².

The introduction of modern technology in education is very useful but at the same time the learning process has to be respected. "Educational activities, particularly in the computer area, have suffered from being too detailed and have prohibited students from obtaining holistic views"¹³. Large horizons are needed: "Students should learn details, for example of syntax and of a programming language, only after principles and appropriate contextual frameworks have been established"¹⁴.

Creativity has to interplay with technology and the target of this creativity has to be human development and not merely efficiency and a faster production. Unidimensional technology, as well as resistance to technology, are possible but very risky solutions. Social and aesthetic values cannot simply run parallel to scientific and technological ones, the creative human adventure needs to combine all of them.

Interaction between scientists, technologists, artists, social scientists etc., is necessary, knowing that all of us may belong to these categories. Economic technological determinism is unfortunately a reality that many people have to face, but still, human creativity can oppose it, making economic and technological development an instrument for equal opportunities and not for domination. Everybody can contribute to it in his daily life.

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