AUTOMATION—IT'S CHALLENGE TO EDUCATION

An Analysis of the Problems Posed by Automation

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PREFACE

This paper is concerned with the effects and demands of automation upon education systems.

Before we can determine the effects it is necessary to define automation. Having done this we can then determine some of its effects. One of its most noticeable effects is its influence on the labor market. Automation affects the labor market by displacing non-skilled workers or those having low level skills. This results in unemployment and the need to retrain displaced workers.

Retraining is by no means a simple operation since it requires adaption to various aspect of the psychology of adult learning. Added to the problem of unemployed adult workers we find that the schools "produce" a large number of dropouts and reluctant learners which tends to swell the number of unemployed.

In order to discover how the schools can reduce the number of dropouts and reluctant learners we must analyze their psychological and environmental causes and search for deficiencies in the educational system.

Looking at another aspect of the problem we conclude that: "...continued desire to learn and achieve is a prerequisite to efficient adaptation in a society based on automation." This requires that we examine learning motivation and methods to increase it.

Having passed through the above stages we are in a position to make constructive criticisms of the education system as it is at present constituted and set forth proposals for its revision to meet the challenge of automation.

I. Automation

A. *Definitions.*

What does the word "automation" mean? The vice-president of Ford Motor Company, D.S. Harder, was the first to define it in 1947. He defined it thus: "Automation is a philosophy of manufacturing where machines are hitched together so that they feed each other without human intervention and produce either a completed product or a major component of a final product."[1]

John Diebold elaborated on this definition by stating that "...the distinctive feature of automation is the application of *feed back* through which machines control their own operations, i.e. there is a self-correcting mechanism by which computers feed new information to the machines they control so that these machines continuously turn out the specified product."[2]

The above definitions do give us some idea of the economy of labor involved in the process but do not give any indication as to its effect on our standard of living and its impact on employment. The full impact of automation, with all its ramifications, in the realms of employment, education and leisure patterns has not yet been fully studied or evaluated. At this moment studies are in progress to meet the challenge which automation presents to our whole way of life. In order to meet this challenge of change we must be educated to deal with it in an intelligent way.

We must, if we are to have a clear idea of the problems involved, know something of the nature and use of automation and computers. There are two main categories of devices. The first is the one usually referred to when one talks of "automation." It is made up of

1) Buckingham, Walter, *Automation: Its Impact on Business and People* N. Y., 1961, p. 5.

2) Diebold, John, *Automation: Its Impact on Business and Labor,* Planning Pamphlet No. 106, Washington D.C. May, 1959, p. 3.

devices that automatically perform motor and sensing tasks, replacing or improving on human capacities in performance. The second category is made up of devices that carry out, at high speed, routine or complex logical and decision-making tasks, usually much more rapidly and efficiently than humans. These are commonly called "computers." There is a certain amount of overlap between the two categories in that we have mixed systems whereby computers control and correct for error complicated processes.

There are automated systems in operation at this moment which are built to detect errors in their own performance and indicate these to men, make judgements based on programmed instructions, "remember" and search their "memories" for appropriate data, either programmed into them or acquired in the process of manipulating new data. Thus they can learn on the basis of past experience with their environment. Michael writes of a machine, designed by Dr. Frank Rosenblatt, whose behaviour is not completely controllable or predictable.[1] It can learn to recognize what it has seen before and to teach itself generalizations about what it recognizes. It also can learn to discriminate, and identify shapes similar to those it has seen before. Most important of all it is not possible to predict the degree and quality of recognition that it will display as it is learning. Dr. Rosenblatt designed it to learn and discriminate in the same way that it is believed man does; it has its own pace and style of learning, of refining its discriminations, and of making mistakes in the process.

Thus we can no longer be smug in our assertion that since man has constructed the machine he will always be more capable or smarter than his creation. Norbert Wiener backs up this condemnation of smugness: "It may be seen that the result of a programing technique of (automation) is to remove from the mind of the designer and operator an effective understanding of many of the stages by which

1) Michael, Donald, N., *"Cybernation: The Silent Conquest, A Report to the Center for the Study of Democratic Institutions"*, 1962, p. 8.

the machine comes to its conclusions and of what the real tactical intentions of many of its operations may be."[1] We have already entered an age in which machines can do more work, more rapidly and more efficiently than most men if not all men. It is an age of great moment and great promise. In 1957 it was expressed by the National Association of Manufacturers thus:

> For the expending, dynamic economy of America, the sky is indeed the limit. Now more than ever we must have confidence in America's capacity to grow. Guided by electronics, powered by atomic energy, the magic carpet of our free economy heads for distant and undreamed horizons. Just going along for the ride will be the biggest thrill on earth![2]

When this was written not much thought had been expended on the possibility of negative side effects that might accompany the positive aspects of automation. It is mainly with the former that we shall deal in this paper.

B. *Reasons for Introduction.*

Among the most common reasons for the introduction of automation to various fields are: to increase productions; to reduce costs; to increase efficiency; to make jobs easier; to perform jobs that could not be done otherwise. "As automation is applied, man's job shifts to that of the planner, monitor and maintainer—the machine does the work."[3]

C. *Snowball Effect.*

There is a noted tendency that when automation is introduced in one area (for example the production side in a factory) the tempo is

1) Wiener, Norbert, "Some Moral and Technical Consequences of Automation" *Science,* Vol., 131, No. 3410, May 6, 1960, p. 1356.
2) *Calling All Jobs,* National Association of Manufacturers, N.Y., October, 1957, p. 21.
3) "Automation", *Encyclopaedia Britannica,* William Benton (Publisher) N.Y. 1961, Vol. 2, p. 783.

increased in such a way as to make it necessary to introduce it into other areas (e.g. the paperwork and sales sections of the same company.) Thus, we see that automation has a snowballing effect. We note that rather than those displaced in one area being transfered and retrained to help in another area now under pressure, there is a tendency to introduce automation to that area, too, thereby creating further displacement of human labor.

Automation systems tend to become faster, larger and more complex and their applications place emphasis on systems design, on the use of theory and analysis and on the use of electronics, especially in computing and information-processing machines.

"Automation means the ultimate divorcement of man from the machine as an integral part of its operation"[1] This means that there has to be a drastic increase in the ratio of technical personnel to the total of skilled, semi-skilled, and unskilled labor if we are to keep up with advances in automation. Are we producing enough technical personnel in our schools? Is our education system geared to meet the future? How many dropouts are there and why do they drop out? What happens to these dropouts now and what will be their place in society in 10 to 20 years time? These are but a few of the questions which the challenge of automation requires us to answer.

D. *The Displaced Worker.*

A brief summary of how automation has affected the blue-collar worker should be sufficient here, and later we shall see its effect on the clerical worker.

1) *Blue Collar Works.*

"Because of technological changes, about 200,000 production jobs have been eliminated in recent years in the aircraft industry alone even though the industry's total business has continued to increase".[2] In

1) "Automation" *Encyclopedia Americana,* Vol. 2. N.Y. 1964, p. 643.
2) Kilpatrick, Franklin, P., *Automation and the Challenge to Education,* N.E.A., Washington, D.C., 1962. p. 164.

other fields, too, large numbers of workers were displaced. In the highly automated chemical industry, the number of production jobs has fallen 3% since 1956 while output has soared 27%. Though steel capacity has increased 20% since 1955, the number of men needed to operate the industry's plants-even at full capacity—has dropped 17,000. "Auto employment slid from a peak of 746,000 in 1955 to 614,000 in November (1961)...Bakery jobs have been on a steady decline from 174,000 in 1954 to 163,000 last year (1961). On the farm one man can grow enough to feed 24 people; back in 1949 he could feed only 15".[1]

2) *Service Industries.*

It has been assumed by many that the Service Industries would be able to absorb the displaced blue-collar workers but this is not possible since the Service Industries have also taken to automation. Thus we find that the U.S. Census Bureau used a mere 50 statisticians in 1960 to do the tabulations which required 4,100 in 1950. The introduction of vending machines, self-service stores, automated banking systems and business machines has eliminated a vast number of jobs. Since the need for more workers due to expanded output and foreign trade has absorbed many workers we tend to ignore the problem.

We are at present training students in our high-schools for occupations which are rapidly becoming automized and teaching them skills which are rapidly becoming obsolescent. Schools must be guided by estimates of what will be required of a worker not just next year but in 10 to 15 years.

E. *A Study The Effects of Automation on Clerical Personnel.*

At this point let us glance briefly at the summary and conclusions of a study,[2] made by the Bureau of Labor Statistics, of twenty large

1) "The Automation Jobless...Not Fired, Just Not Hired" *Time,* Vol. 77, No. 9, Feb. 24, 1961, p. 69.

2) *Adustments to the Introduction of office Automation,* U.S. Department of Labor, Bulletin No. 1276, May, 1960, p. 3ff.

offices which have installed large-scale electronic data-processing equipment. It is necessary to quote this study at length since it gives us quite a clear picture of certain aspects of automation to be dealt with more fully later in this paper. It is useful for our purpose since it gives both the positive and negative sides of the question. It must be remembered that the offices in this study were large, therefore there was a possibility of transfering workers to other sections not at that time being automated. This may not be possible in smaller companies.

Management Objectives

The introduction of a large-scale electronic computer increased data-processing capacity and provided a means of achieving significant operating savings on a variety of large-scale routine activities such as payroll preparation and billing. There, saving generally resulted not only in a larger clerical output with the same or fewer employees—a major objective—but also economies in processing time, space, and equipment, and greater accuracy. Moreover, some offices were able to process data for management decision making that were previously uneconomical to collect. This new information increased the clerical workload. But, by extending management's control over inventory, other operations and conditions, the acquisition of such data also opened up the possibility of achieving savings in nonclerical activities.[1)]

The last point is of especial interest, "...has opened up the possibility of achieving savings in nonclerical activities.", in connection with the "snowballing effect" mentioned earlier in this paper.

Personnel Planning for Transition.

The installation of a new computer involved a sequence of administrative, technical, and personnel changes that, on the average, spanned nearly 3 years. This long preparatory period was particularly useful in avoiding extensive dislocation of employees. During

1) *Ibid.*, p. 3.

this preliminary period, most of the offices studied informed employees about prospective changes, assured those affected of job security, and curtailed hiring to fill vacancies. In the seven offices where employees were organized, existing contracts provided machinery for employee notification and the application of seniority rules in displacement and transfer. A few of the contracts contained provisions regarding consultation, training, and severance benefits.[1]

Where planning is carried out hurriedly and without due consideration to the employees there is likely to be confusion and unemployment. This is especially so when a company needs to automatize rapidly to stay in business and when labor is abundant so that the company does not have to automatize circumspectly. It is worthy of note that many Unions are now demanding provisions under "Automation" in their labor contracts to protect the rights of labor. The problem will come to a head when the labor market is flooded with workers. When this happens the Unions may lose some of their bargaining power.

Extent of Displacement and Reassignment.

Within one year after the installation of the computer, about one-third of the approximately 2,800 employees in units whose work was directly affected had been reassigned to other positions, either within the same unit or elsewhere in the office. A majority remained in the same position. Close to one-sixth had quit, retired, died, or had taken leave of absence. Only 9 persons had been laid off. Altogether, employment in the affected unit had been reduced by about 25 percent at the end of the year.

A little over 80 percent of the employees affected by the change were in jobs involving posting, checking and maintaining records, filing, computing, or tabulating, keypunch, and related machine operations. Most of the remainder were in administrative, supervisory, and accounting work. Only a little over 4 percent were

1) *Ibid.*, p. 3.

engaged in the less routine clerical jobs such as correspondence, stenographic, and secretarial work.

About two-thirds of those workers still employed in the offices one year after the installation continued to do the same type of work. Only about 16 percent of this group were shifted to a different type of work, e.g., from posting and checking to computing. A little under 2 percent ... were transferred from the affected group to electronic data processing jobs.

Close to one-third of the employees in the affected group had been promoted to a higher grade. A negligible number had been downgraded. Most of the upgrading involved employees under age 45 and to some extent reflected promotions which would have taken place regardless of the advent of the new equipment.

The relatively favorable experience of these offices reflected the widespread adoption of policies to provide job security, the continued growth of the clerical workload, and the high rate of labor turnover during a period of prosperity. Since these were large offices, employees could be transferred to jobs without retraining (with the exception of those assigned to electronic data processing.)[1]

The point to reflect on here is whether a *small* company could bring about transfers and increase its clerical work load in such a smooth manner. Also in the next section we note that the 15% rise reported for clerical and kindred workers in the Nation as a whole would certainly have an effect on the number of jobs opening up in a large company and it may well be that instead of hiring the usual number of new employees in other sections, the displaced workers were used instead.

Effect of Growth of Office Employment.

In the offices studied, the groups directly affected by the introduction of electronic data processing represented, on the average, only

1) *Ibid.*, pp. 3 and 4.

about 5 percent of total office employment. Since the companies planned to apply the computers to other activities a larger proportion of office employees will obviously be affected.

Despite the reduction in labor requirements for the tasks performed by the computers, total employment of the offices as a whole rose. Over the 4 years from December 1953 to December 1957, total office employment at 17 of the offices studied increased an average of 7 percent. This increase, however, was less than the 15 percent rise reported for clerical and kindred workers in the Nation as a whole. In 6 of the 17 offices, the increase was greater than 15 percent; in 7, less; and in 4 there was a decrease. Although the immediate effect of electronic data processing suggests some retardation in the growth of office employment, particularly part-time work, the experience of some offices suggests the possibility of expanding employment in new areas of office activity to handle information which had previously been uneconomical to acquire.[1)]

Creation of New Jobs.

A small number of new positions were created to operate, program, and manage electronic data-porcessing activities. An average of 29 persons was employed in these units at the time of the study. Close to 7 out of 10 persons in electronic data-processing work were in programming and planning positions, about a quarter were engaged in operating the equipment, and 8 percent of the group were in administratrative and supervisory positions.

Wage and Salary rates were generally fixed through existing job evaluation and personnel classification systems and where the employees were organized with the participation of the unions. The offices generally rated these new positions at somewhat higher grades than jobs in other data processing, placing them at the top of the office pay structure.[2)]

1) *Ibid.*, pp. 4 and 5.
2) *Ibid.*, p. 5.

It is interesting to note the nucleus of a new class. These people need special skills and this points to a need in educational programming which is just opening up and is being recognized in some school systems.

Change in Grade Structure.

The introduction of electronic data processing raised the average grade or skill of office occupations, but only to a slight extent. Routine low paid jobs becoming vacant during the transition period were eliminated, which resulted in the higher paid group making up a larger proportion of the total in the affected group. The classification of electronic data-processing positions at the top of the office pay structure also tended to upgrade the pattern. Since the newly created positions constituted a small proportion of total office employment, however, the net effects on the structure of an entire office was small.[1)]

Here we should note that jobs becoming vacant were eliminated.

Selecting and Training Employees.

More than 80 percent of all employees in the new positions were selected from within the offices. Those hired from the outside were primarily trainees. Of the 915 employees in these new positions, only 52, or close to 6 percent, were selected from among employees whose work had been directly affected. Most offices used standard tests of learning ability and numerical aptitude to screen applicants for these positions but based their selection on individual interviews and appraisal.

Typically, the persons selected for programming and planning work, which accounted for the largest group of new positions, were men between the ages of 25 and 34, who had some college education, and who had been engaged in accounting, procedure analysis, or related work. Few women or older workers were chosen for the

1) *Ibid.*, p. 5.

newly created positions. Four out of five employees assigned to these positions were upgraded. All offices provided at least 4 or 5 weeks of formal classroom instruction for programmers and and on-the job training for operators of the equipment.[1)]

The glib answer that the displaced worker can be trained to work the computers does not seem to be justified in practice since only 6% were selected. It is of interest to see what type of men was selected—those from the lower age group having some college education.

Some Problems of the Change over, and the Implications for Older Workers.

Although layoffs were averted for all those whose jobs were eliminated, reassingning employees and staffing the new positions sometimes involved complex personnel problems... Finding suitable positions for long-service employees, especially supervisors, without disturbing promotion opportunities of other employees, presented difficulties. Partly because of the newness of the field, establishing salary levels for the new jobs and interpreting tests for selecting staff caused some uncertainly. In unionized offices, there were sometimes prolonged negotiations over which, if any, of the new positions would be within the collective bargaining unit.

Older employees were affected by changes in job status to a lesser extent than younger workers. They benefited from general policies assuring job security, seniority provisions in union agreements and similar protective provisions in agreements. However, they were not promoted to the newly created electronic positions to the same extent as were younger workers, nor were they hired as trainees. Their educational qualifications, employer's opinions, and pre-existing hiring practices, as well as their own lack of confidence in their learning capacity, were said to be among the factors retarding their advancement. In the few cases in which they were assigned to

1) *Ibid.*, p. 5.

computer work a sense of responsibility and their maturity and experience were considered important factors in favor of older employees.

In those instances where employers had formed opinions about the inflexibility or lack of adaptability of older workers, the introduction of electronic data processing may have intensified reluctance to hire or promote them. The examples of the successful performance of older employees in these new positions reinforce the findings of research workers on the variability in learning capacity at all ages...[1]

This study has enabled us to some extent to grasp some of the implications of automation for our way of life and our education system. We shall deal at length later with adult retaining and the psychology of adult learning but let us consider here the effects of automation on the psychology of the individual.

F. *Phychological Effects.*

Automation and technology are creating a situation of unpredictability and great complexity which tend to produce feelings of confusion and inadequacy among many people. If these feelings are not countered, they could lead to withdrawal, denial, regression and a general state of apathy.

In order to prevent this people must be helped to gain some perspective by finding a means of standing apart from their immediate situation and evaluating things in their larger context. One of man's basic needs is a concept of self-identity. This is impossible to gain unless there is a certain continuity between past, present, and future. Education must plan in order to establish bridges for the individual. In other words, educators must do their best (with the aid of experts from the other sciences) to anticipate events and plan for them accordingly, setting in motion programs for retraining and re-education far enough in advance to provide the individual with the continuity

1) *Ibid.*, pp. 5 and 6.

he needs to function effectively and to retain his concept of self-indentity.

G. *The Impossibility of Arresting Its Development.*

Some critics of automation, seeing the possibility of mass unemployment, delinquency, too much leisure and the problem of who is to buy the products of automation if there is large scale unemployment, have suggested that automation be banned before it is is too late. Can we stop it and yet maintain the position of a modern nation? Can we stop it by making it illegal or unprofitable to develop automated techniques? The answer is "No" unless we virtually stop the development of almost all new technology and a good part of the general development of scientific knowledge. In order to accumulate knowledge in many areas of science we must depend on computers. Now, to refine computers and make them more versatile requires research in almost every scientific area, It also requires the development of a new technology, usually automated, to produce the parts needed to build new computers. So long as we choose to compete with other parts of the world, we must develop new products and new means for producing them more efficiently. We can only do this in a significant way by using automation. If we choose to live in a world guided by science and its technology we have no other choice but to encourage the development of automation. Thus it seems that a ban on the development of automation is not feasible. We must find some other answer to its challenge.

H. *Its Implication for the Dropout.*

As we stated earlier, automation tends to upgrade the level of skill required of the worker. This upgrading of skills in turn requires a higher level of education and a flexibility to learn new skills as needed. For work connected with the operation of computers, for example, selection of personnel largely reflects the level of education the selected person has attained. The following table gives some indication of the

level of education required for selection to computerized jobs and the poor chances of the high school dropout.

Table 1. Educational level of employees in affected units and in electronic data processing.[1)]

Educationl level	Employees in affected units				Employees in electronic data-processing positions			
	All employees		Employees age 45 & and over		All employees (including new hires)		New hires	
	Number	%	Number	%	Number	%	Number	%
All levels	[1] 2.799	100.0	[2] 638	100.0	[3] 915	100.0	[3] 173	100.0
Grade school, nongradute	8	0.3	6	0.9	—	—	—	—
Grade school, graduate	95	3.4	79	12.4	6	0.6	—	—
High school, nongradute	374	13.4	209	32.8	40	4.4	1	([4])
High school, graduate	1,600	57.2	191	29.9	340	37.2	26	15.0
Business school, graduate	255	9.1	64	10.0	42	4.6	3	1.7
College, nongraduate ...	273	9.7	62	9.7	100	10.9	9	5.2
College, graduate	162	5.8	19	3.0	316	34.5	112	68.4
College, postgraduate ...	32	1.1	8	1.3	71	7.8	22	12.7

[1] Excludes 16 employees for whom educational data were not available.
[2] Excludes 6 employees for whom educational data were not available.
[3] Excludes 1 person for whom educational data were not available.
[4] Number is too small to calculate percent.

It should be noted that out of a total of 583 high school dropouts, of whom 209 were over 45 years old and therefore presumably efficient in the use of figures, only 40 were chosen for the new work

1) *Adjustments to the Introduction of Office Automation, oy., cit.,* p. 53.

and only one was hired. The majority had continued their education beyond high school. It is already difficult for the dropout to obtain work and this tendency will increase. Taking the age group 17 to 21 who are out of school and have no jobs we find that, "There are reported to be more than 50,000... in New York City alone. Many of them have school diplomas, but they have not acquired what is required to enable them to find their place in the world of work."[1] What strikes one as even more amazing it the following quotation which gives us some idea of the magnitude and urgency of the problem: "New York City's yearly expenses on welfare and correction for those under 21 total 465 million dollars, or more than half as much as the metropolis spends on its schools."[2] This was in 1964 and the trend is toward an increase rather than a decrease in unemployment among the young. Employed dropouts are the first to be laid off and are the first to be displaced by automation since their skills are usually rudimentary. We must, therefore, devote some of our time to analyzing what are the chief causes of dropping out of school and what preventative measures must be taken. From the foregoing pages we have learned: what automation is; that its development can not be halted without disastrous consequences; that it requires an upgrading of education and skills; its grave implications for the old, the dropout, and for the education system as a whole from the angle of maintaining the individual's psychological equilibrium, flexibility and ability to learn new skills as required.

Before we enter into a discussion on the psychological aspects of retraining and the dropout we must first consider a closely related problem. This is the problem of choice. It is a very important problem since all too often when a man fails to undergo retraining or to get another type of job when he has been displaced, we tend to accuse him of *choosing against* a course of action which we consider

1) Arnstein, G.E. "The Problem: An Introduction", *No Room at the Bottom,* N.E.A., Washington, 1962, P. 2.
2) Velie, Lester, "Automation", *Reader's Digest,* May, 1964 pp. 145/6.

would be beneficial to him. We tend to do the same with the dropout. In the next section we must consider if "choice", as it is usually defined, is always operative in such cases.

II. The Implication of Chosen and Unchosen Acts for the Dropout and the Displaced Worker.

Two of the problems which in part are the result of automation and in part due to the failure of the school and society are those who dropout of school and can not obtain work and those displaced workers who do not undergo retraining when it is available.

This section deals with an aspect of the above problems which must be faced by the educator if the trend toward largescale unemployment of those having no skills (the dropout) and those having no skills or obsolescent skills (the displaced worker) is to be contained.

It is usually thought that the dropout "chooses" to leave school and that the displaced worker "chooses" to remain idle rather than undertake retraining. What exactly do we mean by a chosen act? The meaning implies that: "If an individual is going to make a choice from among the alternatives available, not only must there be an outcome that he prefers above others, but also he must have an expectation that choosing the act will lead to the preferred outcome."[1)]

Before entering into an analysis of choice I wish to illustrate the non-technical way in which Irwin puts his point across; this point being that the fact that a person performs as action does not prove that he has chosen to do it. The following quotation should be sufficient;

1) Irwin, F.R. "Unchosen Acts", *No Room at the Bottom, op. cit.* p. 49.
Note: I am much indebted to Professor Irwin for his insights into the chosen and unchosen act and I think them of such importance for their implications for education that I have gone into the problem at some length.

My walking into my office five days a week at a regular time does not demonstrate that I am choosing to continue to be a psychologist. Nobody has offered me an alternative to this; the alternatives that do exist are not obvious; my life would be much harder if I had to make such a decision every day. It is the same for everyone. You do not choose your career every day; you do not decide your whole life every day. No one could live under these conditions. The mere fact that you are doing things does not mean that you have chosen to do them. Last Sunday, I did not go to my office. This did not mean that I *chose* not to go, for I rarely go to my office on Sunday. However, when I do go, that is something out of my routine and can probably be regarded as the result of choice.[1]

Thus, it is possible for the dropout to leave school without ever having *decided* to leave school. Irwin points out that "He may have decided no more about it than I did in deciding to go to college. The step was simply taken for granted;..."[2] Or as in my own case, in Scotland, as to whether or not to go on to college no decision was made; it was taken for granted by myself and my friends and family that I would not go to college. There was no social expectation that we should go to college: therefore no choice was presented. Only some years later did I find that there was a possibility for choice. In a similar way, the socio-economic and familial circumstances may be such that the child is *expected* to drop out of school in the tenth or eleventh grade. Hence, no choice at all may have been involved.

With regard to retraining or the adoption of a Sunday routine for every day, while it may be based on a real choice among the expected outcomes which have been evaluated, it may exclude retraining without, retraining being a viable alternative in the choice situation.

Since it seems highly doubtful if we can consider a man responsible for all the consequencies *that did not occur* because he did not elect

1) *Ibid.*, p. 50.
2) *Ibid.*, p. 50.

some alternative, it would seem that if a certain decision is made that excludes a particular course of action (e.g. retraining), this need not necessarily mean that the choice has been *against* the excluded course of action.

Looking at the problem in this light leads us to the realization that a particular consequence (e.g. leaving school) may play no part in the decision, or it might play a heavy or a light part. To take a simple example, a boy may want a new car to keep up with his friends or to impress his girl friend and decides that in order to do so he needs a job which at the same time gives him a feeling of independence and status. In his decision to take a job which is offered the consequences of leaving school may or may not have played part in his "choice". It would be a difficult problem of psychological diagnosis to determine what had been chosen for and what had been chosen against in this case.

What has been stated above is a rather over-simplified account of the process of choice. Let us now consider a little more deeply what is meant when we say that the student chose not to attend school any more or the worker chose not to be retrained.

There are two types of acts in decision making:

a). those that form alternatives in decision processes and are chosen for or against and;

b). those that occur or fail to occur without having been the object of choice.

From this we come to see what is *essential* if an act is to be regarded as chosen. There must be a *preference* for one consequence over another consequence and there must be an *expectation* that this particular act rather than an alternative act will lead to the desired consequence. The important point to note is that a choice is always *both* a choice of one *act* over an alternative and one *consequence* over another. Whenever an act does not meet these criteria, it is not a chosen act. From what has been said it will be seen that we often

misclassify acts and call them chosen when in fact they were, from the psychological point of view, the irrelevant consequences of a choice in which they took no part.

What is the significance for the dropout and the displaced worker? Well, if the educator wishes to increase the probability that a certain act be chosen, such as continuing in school or engaging in retraining, then it is necessary to arrange that: a) this act rather than an alternative be *expected* to lead to a particular consequence and b) that this consequence be *preferred* over alternative consequences. In the past, while (b) has often been emphasized, (a) has often been almost disregarded. Irwin deals with what he terms "routines" and suggests that the working man develops a set of routines which he follows every work-day (e.g. getting up at a certain time, having breakfast and leaving the house for work at a certain time) and another set of routines for use on Saturdays and Sundays. When he is displaced by automation and becomes unemployed, if the unemployment continues, he will soon use the Saturday/Sunday routine every day. There is, of course, no choice in the routine—he does not *decide* to go to work and not to go to work on Saturday and Sunday.

When, for the displaced worker, this change-over of routines occurs it would be incorrect to think of him as making a *conscious choice* each day not to look for or not to engage in retraining.

It is not enough to just make retraining available and interesting—it is necessary to make retraining a true alternative for choice. Thus, the school must identify potential dropouts as early as possible and the continuation of education must be made a true alternative for choice and that this act rather than alternatives be expected to lead to a particular consequence (e.g. a good job or high status) and that this consequence be preferred over alternative consequences. This is, of course, based on the assumption that the school is in fact the best place for him to be and can provide the necessary experiences to materialize the particular consequence which is being aimed at. The same goes for retraining.

III. Retraining of the Displaced Worker—Physiological, Psychological and Practical Difficulties.

As has been previously pointed out automation decreases the number of unskilled jobs and increases the number of highly skilled. The number of dropouts is expected to be in the region of $7\frac{1}{2}$ million in this decade which will provide a super-abundance of unskilled labor for a rapidly decreasing number of unskilled jobs.

Firstly, I wish to approach the problem from the point of view of the psychology of adult learning in so far as it will effect retraining programs in order to analyze what can be done for those who will need retraining in the near future and to ascertain in what way our education system must be adapted if we are to provide a smooth transition from one job to another in the future.

Secondly, I will make some mention of what is being achieved at present in the field of retraining and give some indications as to why present methods are unsatisfactory.

Starting with the assumption that the worker of the future will need to undergo retraining or at least the updating of his skill quite frequently, it is necessary to analyze the special features encountered in adult learning. For example we must analyze what are the limitations and potentialities of man during middle and later adult years. Also, to what extent does the aging process impair the capacity to learn, remember and to adjust?

A. *Biological Depelopment.*

Though not a great deal is known of the biological effects of aging on learning, some factors have been well documented. Muscle strength tends to decrease after reaching its peak in early adulthood. This may be a limiting factor insofar as it is necessary for learning new skills. Neurophysiological aspects will be dealt with later.

B. *Chronological Age.*

It would seem that social concepts largely determine the limits on learning where chronological age is concerned. While social patterns in every type of society and every age determine to some extent behavior appropriate to each chronological age level, as such adeges as "An old dog cannot learn new tricks" reveal, it can be shown that if appropriate training is given and if the motivational level is sufficiently high then we should revise the adage thus: "An old dog cannot learn new tricks unless he wants to". If we are to meet the challenge of automation we must change the negative conviction into the positive conviction that—"One is never too old to learn".

Where experience is controlled in mental tasks it has usually been found that the old learn more slowly than the young. In other tests of intellectual capacity verbal performance tends to hold up, while nonverbal tasks where speed is involved tend to deteriorate. But Donahue points out that, "...decline... (is) less marked in persons with higher intelligence and/or more education."[1] This is a very important point and has great significance in any plan for the reorganization of the edcational system.

C. *Neurophysical Differences.*

From the neurophysical aspect we note that an overt change in behavior response requires a change in established neural patterns of response. Also to be noted is the fact that there are limits to the speed which the neural mechanisms can handle and switch incoming impulses to alternative channels. What does this mean in terms of adult learning? It means that since the adult has more established neural patterns than the young it may require more time for "new" incoming material to be accommodated: therefore learning in which speed counts is bound to be slower. But we should not confuse speed of absorption with capacity for learning. This is an all too common

1) Donahue, Wilma, T., "Adult Learning: Limits and Potentialities." *Automation and the Challenge to Education,* N.E.A., 1962, p. 22.

mistake. Other factors which must be considered in test results which compare the old with the young are as follows :

a). Mental tests in which marginal snap judgements and chance-taking attitudes predominate favor the young since the old tend to be more on the conservative side.

b). The problem of motivation comes into the test situation since the older person will not really try very hard if he "doesn't see any point in it."

c). Familiarity and practice with test materials usually favor the young.

d). The older person tends to seek a meaning in the questions rather than just doing the problem.

e). The greater caution and higher accuracy attributed to the older worker in the working situation is seldom evident in test situations.[1] Also they tend to persist in their errors—this may be due to old responses, inappropriate to the new situation, which hamper the new learning situation.

D. *Need for Continual Exercise of the Intellect.*

Let me attempt to summarize the important aspects of adult learning significant for retraining. Many years ago (1928) E.L. Thorndike expressed the opinion, in his account of adult learning, that the apparent loss in the ability of adults to learn is the result of disuse or lack of practice. This opinion has had ample backing from later researchers such as Sorenson, Kanin and Anderson. If the older learner is given time he has just as great a capacity to learn as the younger person. More repetition of the material is often needed for the adult learner since extinction of conditioned responses must take place otherwise there is a tendency for the more practiced phase sequences to be triggered by the presenting stimuli and consequently it is more difficult

1) Welford, A.T., "Psychomotor Performance", *Aging and Human Skill,* London, Oxford University Press. 1958, p. 294.

to set up a new response. There is also a tendency, noted by Welford,[1] for responses that are too well established to "work loose" and appear in contexts where they are not appropriate. It may well be that with certain adults the possession of a well established set of responses may in fact prove a handicap to learning since the neurological traces can prove to be inhibitors to new learning patterns.

Since good learning takes place when the learner is highly motivated, it is imperative to interest the learner and most important to challenge him since, if he regards the learning problem as trivial or too unrelated to life and meaningful experience or beyond expectation of success, the adult learner may refuse to attempt the task.

Since industry does not employ a young man so much for what he knows as for his proven capacity to learn, the educator must make it his business to produce men with a capacity to learn, and by motivating them to desire to continue learning after leaving school they will still have the ability to learn when it is required of them.

There must be a greater dissemination of knowledge regarding the continuation of the ability of adults to learn and the means of maintaining efficiency through continued use of the intellect. Combined with this, there must be a re-examination of the use of leisure time and efforts must be made to introduce changes in our use of it in such a way as to exercise the intellect in order to stop it becoming "rusty" through lack of use.

From the foregoing it can be seen that among the important factors influencing adult learning are: what is learned, the circumstances under which learning takes place, and its value to the society. These factors will become more and more significant in a world rapidly becoming automated where relearning is no longer a simple change from one task to another but is radical. The psychological effects of these radical changes can be minimized where learning builds on skills already acquired or when linked to definite employment: therefore retraining

1) Welford, A.T., *op. cit.*, p. 321.

should, where possible, begin before the individual loses his present job to avoid the psychological state of insecurity and to prevent a tendency toward reversion to a Saturday/Sanday routine.

IV. An Analysis of the Numbers, Characteristics, Causes and Implications of School Dropouts.

A. *Statistics.*

We shall now examine some of the statistics of the dropout problem based on data gathered from widely diverse areas in order to elucidate some of the causative factors underlying this problem. What, it may well be asked, is the relationship between the dropout and the challenge of automation? It is simply this; it was previously pointed out that automation displaces those workers with low levels of skills and non-skilled workers. These displaced workers must either be retrained or compete for the 5% of the country's jobs which do not require special skill. The experts predict that this percentage will decrease the more such jobs can be done by automated means. Added to the unemployed resulting from the above we can expect, over this decade, some 26 million new young workers to join the labor force, of which $7\frac{1}{2}$ million will not have completed high school and $2\frac{1}{2}$ million will not even have finished elementary school.[1] This means that there will be a demand for new jobs at the rate of 4 million a year for the next decade and many of these job hunters will be unqualified for the new jobs and skills which automation will create.

According to Buckingham in 1962 there were about 900,000 young people between the ages of 16–17 years not enrolled in any school of

1) The figures quoted here and based on U.S. Department of Labor Statistics estimated from the number of children in school now and upon current trends in the dropout rate as quoted by Buckingham, Walter, *Automation and the Challenge to Education,* N.E. A., 1962, p. 1965.

any kind.[1]

Hence, we see the urgency of facing the dropout problem and its implications for the future. There is often a tendency to overlook the effects either unintentionally or because we would rather not know. It seems that the minority groups are the first to be hit by automation. Conant highlights this in one of his researches.[2] He found that in one of the largest American cities, in an almost exclusively Negro slum of 125,000, 70% of the boys and girls between 16 and 21 were out of school and unemployed. In another city, in an almost exclusively Negro slum, in the same age groups, 48% of the high school dropouts were unemployed.

B. *Intellectual Potential-the Loss to the Individual and Society.*

It has long been a popular misconception that the dropout must be of inferior mental capacity. The study made by 0. Ray Warner[3] explodes this misconception. Besides investigating the I.Q.'s of dropouts he has drawn attention to the resulting loss of potential which the nation must sustain. Let us now turn our attention to Table 2. Warner has drawn his data from a number of sources listed at the side of the table.

It is important to note that he classifies those with I.Q.'s of between 80–89 as having no special high school or post-high-school vocational-technical schools. The latter are reluctant to accept students who have I.Q. scores of less than 90. There is a very real need for something to be done for these people. We tend to expect them to complete the "normal" course and we would rather ignore the fact that they have not the intellectual capacity to succeed in the "normal" course or if they do it is only due to an abnormal amount of effort which may

1) *Ibid.*, p. 165.
2) Conant, James, B., "Social Dynamite in Our Large Cities," *Vital Speeches*, No. 18, July, 1961, p. 554ff.
3) Warner, O. Ray, "The Scholastic Ability of School Dropouts," *Selected Reports and Statistics on School Dropouts*, U.S. Office of Education, 1964, p. 11ff.

Table 2—Scholastic ability of school dropouts.[1)]

	Pleace of study	Students who can generally benefit from special education programs		Students who generally have no special high school or post-high school program provided		Students with vocational-technical potential		Students with collegiate potential		Total	
		Below 80 I.Q.		Between 80–89 I.Q.		Between 90–109 I.Q.		I.Q. 110 and Above		Number	Percent
		Number	Percent	Number	Percent	Number	Percent	Number	Percent		
Statewide Part I	Connecticut	1,035	20	837	16	2,738	53	564	11	5,174	100
	Ohio	1,476	23	1,641	25	2,829	44	497	8	6,443	100
	Utah	165	13	248	20	683	54	170	14	1,266	100
	Totals (Part I)	2,676	21	2,726	21	6,250	49	1,231	9	12,883	100
Part II Citywide	Bridgeport	39	16	54	22	134	50	29	12	256	100
	Kanawha	300	28	200	19	522	49	48	5	1,070	100
	St. Paul	54	2	232	10	1,317	56	748	32	2,351	100
	Syracuse	32	14	58	25	124	53	22	9	236	100
	Tucson	56	8	122	18	391	58	100	15	669	100
	Totals (Part II)	481	10	666	15	2,488	54	947	21	4,582	100
	Totals (Parts I and II)	3,157	18	3,555	19	8,738	50	2,178	13	17,465	100
Part III Other	U.S. Dept. of Labor	1,012	25	819	20	1,945	48	256	6	4,032	100
	Totals (Part III)	1,012	25	819	20	1,945	48	256	6	4,032	100
Totals (Parts I, II and III)		4,169	19	4,211	20	10,683	50	2,434	11	21,497	100

1) *Ibid.*, p. 12.
2) *Ibid.*, p. 11.

force them to pay the cost in some other aspect of their personality. From this table it is possible to see the loss of potential but we cannot tell to what extent society must pay for maladjustments and unemployment resulting from these students leaving school.

It must be remembered that the mere physical presence of the student in the classroom is by no means enough. We have at present many students who are dropouts but have not in fact left the school. The school can, in this case, do something constructive if the student is identified soon enough.

Table 3 gives an illuminating insight into the vastness of the dropout problem.

Table 3—Number and scholastic ability of students who dropped out of school before graduation.[1]

	I.Q. scores				Totals
	110 & above	90–109	80–89	Below 80	
Number of fifthgrade students entering school in 1950 who dropped out of school before graduation in 1958	121,000	550,000	220,000	209,000	1,100,000
Number of fifthgrade students entering school in 1955 who dropped out of school before graduation in 1963	114,400	520,000	208,000	197,600	1,040,000
Percentage breakdown of I.Q. scores	11%	50%	20%	19%	100%

If we use the prediction of 2½% million dropouts during the decade of the Sixties and the categories for each I.Q. group we get something

1) *Ibid.*, p. 13.

like this :

Of the dropouts—

825,000 have the scholastic potential to complete a college program, or 82,500 per year.

3,750,000 are potentially able to comple post-high-school vocational technical programs, or 375,000 per year.

1,500,000 (I.Q. 80–89) will have little or no vocational preparation and with few educational programs available to them, or 150,-000 per year.

1,425,000 (I.Q. below 80) will have few limited training programs open to them and consequently will be added to the swelling number of unemployed, juvenile delinquents, and welfare cases at an average rate of 142,500 per year.

From the above statistics we can see that the numbers are vast and the problem requires that something be done, and done soon. It is true that certain projects have been launched to try to deal with the situation but what has been done so far is a mere drop in the ocean and too many of the projects start when it is almost too late for anything to be done. More research is needed into the causes of dropping out and more intense efforts must be made by agencies outside the school to combat the social and psychological environments in which the potential dropout *learns* to dropout.

C. *Socio-economic Environment.*

Let us now turn to Table 4 which gives us an example of how the socio-economic environment comes into the picture. This table also indicates the number of years of schooling which the parents had and separation and divorce rates.

This table reveals a significant relationship between the dropout and his community; between the dropout and the education, income, and marital status of the people around him.

Table 4—Dropout and graduation rates in public high schools, 1960–61. and socio-economic data on city population, by groups of Census tracts, 1960.[1)]

Census tracts by groups[2)]	Census data					High school data	
	Total population (240,473)	Median years of school	Median income	Percent of housing deteriorating or dilapidated	Percent of adults separated or divorced	Percent of students enrolled who dropped out	Percent of students who graduated from high school[3)]
I	28,195	8.4	$ 3,669	43.2	8.1	17.1	37
II	44,052	10.2	4,726	24.3	5.0	10.5	58
III	39,996	11.8	5,308	10.1	4.6	10.4	75
IV	47,863	12.3	5,873	2.5	3.6	7.0	70
V	80,367	12.6	6,804	6.2	4.2	3.7	90

D. *Reasons for Leaving School.*

One last table of data should be presented before we embark on an analysis of the differences between high and low achievers.

Table 5 deals with data collected by counselors in the State of Maryland's 24 local school systems. The collected data from a representative sample of the 13,715 pupils who dropped out of school during the year ending June 30, 1961. As can be seen in Table 5. "Lack of interest" outweighed every othe reason.

1) Miller, L.M., *The Dropout,* Pamphlet, Office of Education, 1963, p. 4.

2) For convenience in analyzing data, Tucson divided the 45 census tracts in the city into 5 major groups on the basis of proximity of the tracts and degree of similarity in the population in income, educational achievement, and housing conditions.

3) Based on number who entered high school 4 years earlier.

Table 5—Reasons for withdrawal given by pupils who dropped out of Maryland public high schools during the year ending June 30, 1961, by color and sex of dropout.[1]

Reason	All dropouts		White dropouts				Negro dropouts				Number not reported by sex or color
			Male		Female		Male		Female		
	Number	Percent of total[2]	Number	Percent of total[2]	Number	Percent of total[2]	Number	Percent of total[2]	Number	Percent of total[2]	
Lack of interest	4,792	35.3	2,184	41.3	1,216	30.4	719	38.9	400	23.1	273
Lack of scholastic success	2,386	17.8	1,190	22.5	514	12.9	388	21.0	201	11.6	93
Cost of going to school and other economic reasons	1,494	11.1	464	8.8	391	9.8	277	15.0	292	16.9	68
Marriage	1,243	9.2	59	1.1	1,074	26.9	7	.4	75	4.3	28
Pregnancy	715	5.3	.....	.....	170	4.2	.....	.....	512	29.5	33
Committed to institution	605	4.5	174	3.3	97	2.4	193	10.4	92	5.3	49
Military service	549	4.1	447	8.5	.....	.....	90	4.9	.....	.....	12
Poor health	426	3.1	104	2.0	178	4.5	12	.7	81	4.7	51
Parental indifference	340	2.5	159	3.0	137	3.4	20	1.1	14	.8	10
Misbehavior	312	2.3	202	3.8	37	.9	51	2.8	5	.3	17
Emotionally disturbed	289	2.1	126	2.4	98	2.5	24	1.3	33	1.9	8
Lack of suitable program	196	1.4	123	2.3	44	1.1	4	.2	12	.7	13
Socially maladjusted	181	1.3	51	1.0	39	1.0	61	3.3	16	.9	14
Not stated	186	.....	53	.....	36	.....	44	.....	40	.....	13
Total	13,715	100.0	5.337	100.0	4,031	100.0	1,890	100.0	1,773	100.0	682

1) Original study quoted in Huffington, P.E., *Pupil Dropout Study: Maryland Public High Schools,* State Dept. of Education, May 1962-and extracted from Miller, L.M. *The Dropout, op. cit.,* p. 3.

2) The base on which the percentage is computed includes only the dropouts who gave reasons for withdrawal. It excludes "Not stated."

E. *Some of the Differences between High and Low Achievers.*

I have attempted to summarize the findings of some of the major contributors to the fields of education, sociology and psychology where they touch upon the high and low achievers. First let us consider some innate (hereditary) differences.

1. *Innate Differences.*

It has been noted that from birth some babies seem to have a temperamental disposition to be quiet and rather vegetative while others demonstrate lively, energetic responses and seem to bubble over with life. While there is not yet enough research evidence to prove any high correlation between early responsiveness and its continued persistence through later life, there does seem to be a definite relationship involved. Other factors, of course, besides early responsiveness are involved in the amount and quality of response in later life.

Innate intellectual capacity is another basic difference and while this can be a good reason for lack of achievement environmental factors play a large part in determining whether or not a child is motivated to work up to his intellectual capacity.

While innate factors are not to be ignored, most of the variables influencing motivation to achieve are environmental rather than innate, and also a child may have a strong drive towards one type of achievement (e.g. sports) while lacking a drive towards another type (e.g. academic work).

2. *The family.*

a) *Parental example.* If the parents are highly motivated to achieve and the child respects them, identification will usually take place and the child will follow the example of the parents, all else being equal. If the parents have "given up the struggle" then the chances are that the child also will not strive to achieve. The child has to learn to seek remote goals and the parents will be a strong influence for or against the learning.

b) *Parental recognition.* It is essential that the parents take an interest in the child's first achievements in various fields and that they give him encouragement. There has to be a nice balance between too much praise given when the child has only achieved something of little consequence, and complete indifference. It is true that we have cases of children who are spurred to even greater feats in the face of parental indifference in order to gain recognition but this motivation is based on a very flimsy foundation and is usually psychologically unhealthy. The child must gradually learn to do without parental reinforcement and give it to himself, otherwise he will lack the necessary internalized drive to do a job for its own sake.

c). *Parental attitude toward and interest in the child's schoolwork.* Where parents value education and take an interest in their child's education, (e.g. meeting teachers, helping with, and supervising home work), the child will feel that it is expected to do well and usually will try to live up to that expectation. On the other hand when going to school is thought of just as a means of getting a diploma necessary for a job, the child has to make all his own decisions—sometimes with disastrous consequences.

d) *Cultural and Educational Background of the Family.* The child from a family in which reading for further education and for pleasure, and an understanding and appreciation of art, music and a varied vocabulary are valued, tends to have a head start over the child from the so-called "culturally deprived" home.

e) *Minimum Physical Standards.* In order for the child to achieve there are certain minimum standards which must be maintained by the home. The child should have sufficient clothing, sleep and medical care. The child should not be dressed in a style which makes him conspicuous in such a way as to be considered odd by his fellow students.

f) *Attitudes toward Work.* In homes where everyone is expected

to work the child learns the habit of work, but in those homes where the child is not expected to work at all—not even to clear up his own mess—he may experience great difficulty in accepting the necessity to do home work and later to work in a regular job.

Having dealt with certain aspects of family influence on motivation to achieve we must now consider in what way these influences can affect the emotional balance of the individual. We must also consider what factors of the emotional set tend to work *for* achievement motivation and those which work *against.*

3. *Emotion and Achievement Motivation.*

It has long been observed that the individual who is completely emotionally balanced is a contented individual and is not one who is constantly striving to achieve. There must be some insatiable desire or drive to achieve more and more. If this drive is not strong then we will have the man who is contented with what he has and what he has achieved. Hence, it would seem that we have to make the individual unhappy in order that he will strive but he must gain reinforcement in the process otherwise he will give up altogether. In other words he must have a long term goal with intermediate goals on the way to give the necessary reinforcing experience that comes with achievement. Let it not be forgotten that the child has *to learn* to set distant goals and must learn to forego immediate gratification for postponed, but greater, gratification at a later stage. This distant goal, as it comes nearer to realization, must be modified in such a way as to result in a new and higher goal. Only in this way will motivation to achieve be a continuous process.

Thus, we see that the high achiever is not the self-satisfied, complacent individual nor is he the uncooperative, uninterested, apathetic individual. Let us now consider this latter type.

Many of them are emotionally maladjusted and feel one or a combination of the following: rejected, guilty, unloved, worthless, insecure or anxious. They feel that they are bound to fail any sort of test

and rather than face it they give up without really trying. Some try to maintain an intact self-concept by rationalizing that they could achieve if they tried but they see no reason to try. Some turn to daydreams and fantasy as a form of compensation in which everything works out just as they planned it would. Psychological treatment is usually necessary before anything can be done for them by way of further education or retraining. Psychotherapy, both individual and group, has been found to be of value in bringing about the new self-concept necessary for re-education and retraining.

4. *Peer group Influence.*

Children usually choose friends who tend to reinforce their own attitudes. Thus, for example, children from the slum areas who feel that school is like a prison usually find that their friends feel likewise, whereas the upper-middle class child with a positive attitude toward school usually chooses friends who share his views. Within the two classes a reflection of parental attitude is found in the children but, of course, within the two groups of children there are cliques which hold attitudes radically opposed to those of their class.[1)]

5. *The School and Motivation.*

We must now consider the effect of the school on the individual, in particular on his motivation to learn, to continue to learn in order to achieve, and finally with regard to its effect on his desire to return to school or to undergo retraining.

a). *The School Experience.*

Many children experience school as a series of challenges which they meet successfully or at least with some measure of success. They develop confidence in themselves and an expanding interest in learning. There are others who experience it as an accumulation of failures resulting in bafflement, confusion, humiliation and resentfulness. They.

1) *Note:* Here when I refer to "class" I mean that based on socioeconomic factors rather than "class" in the European sense.

therefore, tend to resist anything associated with school or learning. The only way in which they can be induced to continue learning is by presenting them with a curriculum which they see as interesting and practical and one in which they can succeed over and over again to gain the necessary reinforcement which they did not get when in school. The curriculum must be challenging since they will soon see through a program which is too easy. If the program is too easy the child will not develop a meaningful concept of his own ability.

b). *Motivation and Student Expectations.*

If the student has been led to believe that the school is the place that merely prepares him for a specific job then he will find a large part of the curriculum irrelevant and will not be highly motivated to achieve in those areas not directly (as far as he sees it) connected with preparation for a job. This emphasis on "job preparation" may come from any one of many sources ; for example, from a particular teacher, peer group, or from parental or community attitudes on the role of the school. There is a happy medium which must be found for the non-college oriented student that is neither divorced from reality nor yet so job-oriented that the student is merely prepared to learn one specific skill to the detriment of his general knowledge and desire to continue learning.

c). *Area of Challenge.*

There are a small number of under-achievers who are never really challenged and feel that school is just a routine to be followed. We are able to work out psychologically an "area of challenge" which is difficult enough to be stimulating yet not so difficult as to preclude success. The student himself is able to do this faster and more efficiently than the teacher is at present, since the teacher first needs a large amount of data which must be properly evaluated. Later I will go in to the question as to how we may be able to use automation to help the teacher on this particular point.

6. *Culture and Motivation.*

Here, let us limit ourselves to certain aspects of the American culture. Where the culture offers opportunities for advancement they are usually taken and the individual is motivated to achieve but where it is limited, as in the case of the minority groups, there is a marked tendency among under-achievers from those groups to hold attitudes inconsistent with high motivation to achieve. In other words, they feel "What's the use of trying?"

Let us now list some of the more important points that stand out in this summary of the differences between high and low achievers and their respective levels of motivation for achievement.

1. Though there are innate differences in intellectual capacities, development to the maximum potential is essential and can only be done by tailoring environmental factors to suit individual needs.
2. Where parental example is poor the school must provide suitable examples in the form of teachers, and also contact between the teachers and parents must be strengthened. Social agencies would also be of value in improving environmental factors and even group psychotherapy for the parents could be instituted. The parent must be made aware of the child's needs with regard to recognition of achievement, encouragement of school work and physical needs. Where the home is culturally deprived, *free* kindergartens would be able to make up, to a large extent, those missing elements by providing many types of experience which it now does only to a limited extent. Again the kindergarten and primary school can begin to develop positive attitudes toword work in their pupils.
3. To deal with emotional problems smaller classes would help, not only for making identification easier, but also as a preventative. It would also enable the teacher to meet the needs of the individual rather than attempting to do it through the group.

Situations must be set up in such a way as to give *all* the children the reinforcement which comes with success and the experience of having overcome a challenge.

4. We shall have more to say about curriculum development, areas of challenge, and methods of increasing motivation later in this paper.

V. Motivation.

A. *The Meaning of Motivation.*

In our discussion we have traced some of the effects of automation, some of the reasons for under-achieving, and some of the problems which have to be faced in adult learning. We have often used the term "motivation" using it in such sentences as: "If we are to face the challenge of automation we must motivate the individual to learn and to want to continue learning." What do we mean by "motivation"? It would be helpful to analyze what is meant by the term and go over some of the basic concepts of motivation then, finally to determine, in what way motivation is relevant to education. At a later stage we shall enquire into ways to increasing motivation to learn and to achieve.

We must first note that there is not much agreement among psychologists as to what constitutes motivation, nor is there much agreement on a consistent theory of motivation. It must also be remembered that many of the concepts of learning motivation are based on simple speed tests, such as cancelling certain numbers in a mixed group of numbers within a certain time period. It may be argued that some of these tests do not reflect learning motivation as witnessed in the classroom or factory. Also many tests have been carried out using college students who are presumably highly motivated to learn and conditioned to the school.

Human drives and urges serve as inner motivations of behavior. These organic and psychological drives include those connected with bodily needs and social needs : for example, the urge to be with other people ; to seek attention from others ; to be recognized and approved of ; to be curious ; to be secure ; and to experience adventure and novelty. Crow says "A child's motive usually reflect the influence of parents or friends upon his inner drives".[1] This is important since it is the parents and friends who will be the influencing forces as to the form which motives will take. Motives serve to energize, select and direct the activities of children. Thus, the chief role of parents and teachers is to aid in giving the child those mental and emotional sets that will cause him to *want* to learn what he should or to behave as he should.

B. *Motivated Behavior-the Developmental Approach.*

If we consider the child developmentally we note that adient behavior[2] usually results when qualities such as sweet taste, soft contact and warmth are presented, whereas aversive behavior in the baby is evoked in only a few situations—usually involving painful or intense stimuli. Exploratory behavior is evoked by certain optimal degree of complexity and familiarity—not so complex as to frighten and not so familiar as to be dull.

There is a definite inter-relationship between these three types of motivated behavior. At the beginning hunger, thirst and cold are distresses like pain but after a short period of learning, food, drink and shelter elicit adient and exploratory behavior.

While the innate forms of motivation remain throughout life they are modified by learning in the same way as a person "graduates" from the nursing bottle to the best Scotch.

It is important to note that aversive motives such as fear and anxiety are easily attached to new stimuli through associative learning which was illustrated earlier in the case of the child who has an unfortunate

1) Grow, L.D., *Child Psychology*, Barnes & Noble, N.Y., 1953, p. 133.
2) Adient behavior is a consistent striving to maintain a stimulating condition.

experience with his first teacher.

C. *Motivations Relevant to Education.*

Let us now consider the motivations relevant to education. They are: 1) the learning to renounce immediate satisfaction for the sake of more distant goals,
2) the development of exploration and,
3) the learning to be gratified by reinforcement in the form of learning that one is correct.

1). *Distant goals:*

The establishment of distant goals can only come about if sub-goals have already been established since children can not work toward some distant goal without varying amounts of gratification which come from the attaining of sub goals.

The conceptual remoteness and the length of delay that the individual will endure vary from one individual to another. Shaffer pointed to two of the key factors, (culture and approval), which influenced the variation between individuals. He stated that: "An important determiner of... symbolic goals seems to be that of living in a culture and in a family which itself pursues remote ends and helps the learner to identify his sub-goals and be gratified when he attains them. The approval of other persons helps the learner to establish self-approval and a perception of being right when he reaches a sub-goal".[1)]

2). *Exploration.*

As previously stated exploratory behavior is innate but in order for it to develop it must be carefully cultivated. It can be easily inhibited. Yet most educational directives are based on the assumption that *every* child gains gratification and reinforcement from new experience. It is possible to observe a large number of cases which prove that we cannot assume that this is always so.

We find that exploratory behavior tends to be inhibited under certain

1) Shaffer, L.F. "Motivation to Learn", *No Room At the Bottom, op. cit.*, p. 23.

conditions where the child receives punishment or lack of reward following self-initiated exploration and when the opportunities for exploration are restricted as in the culturally deprived home. On the other hand, exploratory behavior may well expand if the child is given opportunities to explore and if these opportunities are such that they are of increasing complexity. Approval of this behavior by an influential person is of importance to the child.

3). *The Development of Intrinsic Interest.*

There are many situations in which the child can gain direct or indirect knowledge of success of failure. To be right and to succeed in a task or a problem becomes an end in itself and this is basic to the development of intrinsic interest. The child which does not develop intrinsic interest must always be given some external encouragement such as rewards or large amounts of praise. The latter is not conducive to efficient learning since the child will not attempt a task unless it knows that there is a good chance of obtaining some external reward. The child who has developed intrinsic interest tends to be more highly motivated to achieve than the child who has not developed it. The development of intrinsic interest is intimately connected with the concept of "area of challenge" as previously discussed. It is therefore essential that an area of challenge be worked out for each child at the earliest possible developmental stage so that, among other things, intrinsic interest may be devoloped. We have considered above three of the principle motivations relevant to efficient learning and achievement. We must now see in what way the development or inhibition of the development of these motivations is connected with the problem of the reluctant learner and the dropout. Shaffer's classification of these individuals into : "...the fearful, the angry, and the uninterested."[1] will aid us in this task.

D. *The Syndromes of the Fearful and the Angry.*

Individuals having these syndromes respond with aversive reactions

1) *Ibid.*, p. 25.

to school. Parents emphasizing the faults of a child, may by criticism, deprivations and punishment arouse fear in the child resulting in aversive motivations toward tasks requiring action, exploratory and goal setting behavior. He may begin to develop a sense of incapacity and thereby inhibit exploration and try to avoid and withdraw from educational experiences. The angry syndrome is usually caused by the parents (though it may be the teacher) due to their expecting too much of the child. He finds that he is not able to fulfil his educational tasks and thus they seem to be unfair tasks: the result is anger. These syndromes are not exclusive and there is a tendency for the child to oscillate from anger and stubborn hostility to fear and withdrawal.

E. *The Uninterested Syndrome.*

A large majority[1] of the uninterested come from the underprivileged lower socio-economic groups and from minority groups who experience discrimination in educational opportunities and hiring practices. Shaffer[2] puts forward the hypothesis that the uninterested syndrome is due to lacks and deprivations in the family and in the sub-culture from which the student comes, which prevent him from learning to explore; from learning to be reinforced by the feed-back of right responses; and from learning to strive for remote goals.

Often, for this individual, the teacher seems to be like a being from another world having no connection with his own world: hence, praise or punishment has little effect on him. Lack of success in school combined with the ungratifying knowledge of being wrong help to increase his estrangement from educational tasks. Many of these children do not understand what the middle class person takes for granted: the teacher-pupil relationship, and the professional role relationship. They do, however, understand the employer-employee

1) *Note:* The statistics given earlier in this paper give support to this statement.

2) *Ibid.*, p. 25.

relationship fairly well and this can be utilized for the purpose of re-education and retraining, as will be shown later. The educator must take into consideration value systems and understandings of role relationships when he attempts to formulate programs for the uninterested from the lower socio-economic brackets.

F. *Some Methods for Building up Motivation to Achieve and Learn.*

Automation requires that we face two problems that on the surface seem unrelated but in fact both involve a common factor. These problems are: a) that many boys must be persuaded to learn higher level skills so that they will not be displaced so easily and rapidly, and b) that older men who are displaced must be motivated to learn new skills. The common factor involved is that they will require a higher level of aspiration or achievement motivation. It is imperative that they *desire* to learn new and/or high level skills if learning is to be efficient and value.

While there is not a great deal of agreement among psychologists on how to increase achievement motivation, most would agree with the findings of the Hawthorne experiment—that people who are aware that they are part of an experiment or are on trial will tend to work harder. Really, all the experiment proved was the well known fact that if you know someone cares about what you are doing and especially if they show enthusiasm you will tend to be more enthusiastic in carrying out your task. The difficulty is to maintain in the learner the conviction that there is someone who cares about what he is doing and to maintain at a level where it becomes contagious, the enthusiasm of the teacher.

The above concept of "someone cares" is at the basis of Paul Shea's suggestion that poor but able boys be offered college scholarships in *the seventh* grade. Based on research that the critical age for electing a college course occurs in the seventh grade, if a boy is

presented with the decision[1] as to whether or not to elect the college course and is also promised financial aid conditional on continued good academic performance, there is a very good chance indeed that he will focus on the possibility of a higher level career.

1. *The Need to Change the Self-Concept.*

In order to increase achievement motivation it is necessary to change the self-concept in a certain way. In the case of the seventh grade college scholaship the boy is assisted in changing his self-concept by becoming aware of his potentialities and his own worth. We will now consider some other ways in which the self-concept may be changed thereby making way for higher achievement motivation.

2. *"n-achievement".*

This is a special kind of achievement motivation which is measured by an analysis of spontaneous daydreams or fantasy. Its importance for us lies in the possibility of using it to get people to aspire to higher-level skills.

The limitations of n-achievement are as follows:

1. It prepares a man to act in an entreprenial manner—that is, for jobs that require promotional activity and entrepreneurship.
2. The number of jobs in which entrepreneurship is required are few and are mainly in the executive class for which the social and economic background of the displaced worker might not fit him.

Despite these limitations, there is a range of jobs which does require a certain independence of action and a certain amount of entrepreneurship. These include craftsmen, artisans and independent businessmen. Among these, we have independent plumbers, roof repairers, garage mechanics, gas station owners. These exhibit the characteristics which are to be found in men having high n-achievement since it is necessary for the worker to define what has to be done (goal setting), to

1) Here it is useful to remember what was discovered about choice in Section II. He will only *choose* the college course if it is a viable alternative.

get and use concrete feedback about how well the job is being done, and often he will have to use initiative in finding work to be done. If a man has high n-achievement he will succeed in these jobs.

On the assumption that the above type of employment is not going to decline rapidly (and it seems that there will be a continued need), how are we to increase n-achievement in the displaced worker so that he will be motivated to learn the appropriate skills and take up this kind of work?

Work carried out by the Fels Institute achieved considerable success using the following techniques which I shall briefly describe. The first deals with making the subject aware of the kinds of concerns or fantasies he has by taking and being taught to score n-achievement tests involving desires, obstacles (and how to overcome them), hopes and fears. He is encouraged to write stories which yield high n-achievement scores. He learns what achievement *is*—which is essential if he is to act in an achievement-related way.

The other technique involves various types of games adapted to the subject concerned. The game is set up in a life-like way and is designed to be intrinsically interesting. Thus, underachievers are engaged in racing car games in which they develop initiative and responsibility and learn how to weigh the odds on taking chances. Experiments were carried out using groups of underachieving boys (matched with control groups), training them with the racing car game to increase n-achievement, then later testing their academic performance against the control groups. It was found that the boys who were given the training did significantly better academic work than the control group.

3. *Slack's Method.*

Another way to increase motivation through the development of a new self-concept is the one used by Slack and Schwitzgebel.[1] They

1) Slack and Schwitzgebel, *Reducing Adolescent Crime in Your Community,* Harvard University, 1961.
Note: The authors used their techniques in Boston to cut the rate of delinquent recidivism by half.

hired delinquents to talk about themselves as research experts since they were obviously "experts" in the field. What they said was "taped" and later played back to them. They also took psychological tests, were taught to score them and gained feedback on their major concerns. The pay was directly related to the amount and novelty of self-expression—thus it was a direct incentive to divulge as much as possible about the self. In this manner they were able to expand their self-awareness.

Those concerned with re-education and retraining have often come up against the difficulty of attempting to change the self image which is usually very stubborn in the face of change. The subject often says: "Well, I've always been like this and I guess it's too late to change now." With this in mind let us consider the possibilities which open up on reading the typical stages through which the delinquents passed:

1. apathy—("I can't do anything; its fate.")
2. anger at society—("It's their fault.")
3. despair—("I'll never be able to get out of this spot.")
4. finally—insight and transformation.

While we have a pretty good idea of what inhibits motivation to achieve we need a great deal more research into how to increase it.

VI. A New Approach to Education

In the foregoing sections we covered a considerable amount of ground. We determined the major effects of automation. We analyzed certain problems, from the social, economic and educational view points, which must be faced if we are to deal, in a realistic way, with the threat posed by the wholesale introduction of automation. From our analysis we concluded, among other things, that an upgrading of skills and educational level is imperative but in order to do this we must motivate

the individual to *want* to learn and achieve. Hence, we were forced to survey the field of learning and achievement motivation not only to determine how to increase such motivation but also to find out to what extent the education system is failing in this respect.

We are now in a position to put forward certain suggestions or proposals based upon our analysis. These are contained in a later paper.

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