

AUTOMATION—ITS CHALLENGE TO EDUCATION

(Continued)

by

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VI. A New Approach to Education

A. *Introduction*

In the foregoing sections¹⁾ 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.

B. *The Development of Rational Thought—A Challenge to the Education System.*

One of the most profound changes that we may observe is in the role of the mind in human affairs. We may call it the role of the rational. This includes science in its broadest sense and refers to the

(1) See the previous issue of this journal.

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processes of rational inquiry and empirical validation, the harnessing, through logic and evidence, of the abilities to imagine and recall, to classify and generalize, to evaluate and compare, to analyze and synthesize, to deduce and infer. The role of the rational has become more and more important in our way of life and increases in importance with the passage of time. Yet, only if the school focuses its attention on its development, will these powers be developed in the individual.

The child must be aided to develop transferable¹⁾ intellectual skills and the means to apply abstract propositions to concrete situations. He will have to learn some abstractions abstractly. He must develop the flexibility which will enable him to face new situations and problems without a sense of dread and withdrawal. These are the essentials which the school must implant in the young mind. Here, we will omit discussion of the social and psychological needs which the school must furnish.

C. *Multi-level Approach.*

We have seen that it is imperative that there be a general upgrading of skills and educational level. This can only come about if we tackle the problem from a number of levels. The school must provide the stimulus for the normal child to want to continue learning to a higher degree than is presently the case. Social and educational improvements must be made if we are to reclaim the potential dropout and the reluctant learner. Great strides must be made in the field of adult education and retraining if we are to help the individual adjust to a rapidly changing world. We will go into each of these levels to determine what can be done. But before doing so there are certain considerations which need to be examined.

1) While it was proved that the learning of Latin does not significantly improve one's ability in other subjects there are certain transferable intellectual skills, for example communications skills and the power to generalize, which may be helped by the study of history and the sciences.

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D. *The "Trickle-Up" Theory.*

This theory propounds that by offering opportunities for furthering their skills to those who are comparatively highly skilled (and usually need little external motivation) in order that they may undertake jobs opened up by automation, jobs would become available at the highly skilled level for which less highly skilled workers could be trained and so on. This process would go on until the unskilled with training and perhaps strong external motivation, could be trained to do skilled work. There is something to be said for this theory but it is based on the assumption that tomorrow's world will be the same as today's with the only difference being a matter of degree, and that there will therefore be enough jobs for everyone if the population is up-graded. According to Michael¹⁾, the trend seems to be room at the top but none at the bottom. Yet, it would seem that for the next 10 to 15 years all we can do is to work on the basis of the trickle-up theory.

E. *National Aid.*²⁾

The enormous costs involved in the programs to be proposed will necessitate National funds being allocated. Even at the present time it can be easily shown that equality of opportunity to develop education does not exist.³⁾ Opportunity should not be dependent on the relative richness of the State and/or the school district.

As was pointed out earlier in this paper, while large companies can bear the costs of retraining and organize transfers in such a way as to avoid laying off workers, small companies will not be able to do this. Hence, there will be a need for large numbers of Nationally sponsored retraining centers.

1) Michael, D. N., *Cybernation : The Silent Conquest*, op. cit., pp. 17 ff.

2) The term "National" is used here to stand for Federal aid in America and State Aid in England.

2) Differences in the ability of school districts to pay high teacher salaries and provide excellent school facilities are in part responsible.

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While many people may harbor grave doubts about allowing the Nation to sponsor education due to the belief that the government will attempt to dictate educational policy, it should be observed that in England and some of the Scandinavian countries the bill is footed by the government yet the education authorities retain autonomy.

To be sure, the expenditures involved will be large but they will fall far below the economic gain to society if the workers with obsolescent skills, the dropouts and reluctant learners, the half-educated, the alienated, and the antisocial learners become productive workers. It is well known that we have always under-invested in education but now we can no longer afford to. Let us now turn to what must be done for retraining programs.

F. *Retraining.*

The old concept of work involving the learning of a trade or preparing for an occupation which one will engage in for the rest of one's life will have to make way for a new concept. The new concept requires that the worker be willing and able to undertake three or four different occupations during his life-time, each of which may necessitate the learning of radically new skills or minimally involving a constant upgrading and updating of his particular skill.

As was seen before¹⁾ this requires flexibility and an intellect capable of absorbing new knowledge and techniques. These qualities can only be maintained if the individual is exposed to a continual learning experience.

The working week has been slashed considerably over the last two decades with the result that the worker has more leisure time. There are three main ways in which this extra leisure has been utilized, a) "moonlighting", b) entertainment of a non-educational nature, and c)

1) *Vide* Section III especially D. "Need for Continual Exercise of the Intellect."

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adult education including reading for improvement, regular academic courses, vocational courses and learning in connection with hobbies.

It is anticipated that in the future the working week will be further reduced, so one of our problems is how to persuade the working man to engage in educational pursuits. One answer may be found in the provision of more adult education programs, sponsored by the government and the companies, for which promotion, credit, and tax relief might act as incentives for the lower-skilled workers. It has been found that those who have already attained high levels of skill and education usually need little by way of external incentive to make them continue learning. The company may be able to exert pressure on its workers to continue learning but this can be an inhibiting factor to efficient learning.

It is of the utmost importance to carry out retraining on the job where possible, in order to forestall the development of a Saturday/Sunday routine discussed in Section II. In the case of small companies which cannot undertake retraining, paid "time-off" should be granted in order that the worker may attend a retraining center.

In the case of the least flexible worker retraining must be based solely on his previous work habits and skills and should be gradual. He should be assured of a job on completion of retraining and paid at the same if not a higher rate.

A program for the propagation of knowledge concerned with the problems and possibilities of adult learning must be instituted in order to inform employers and educators of the urgent needs which must be faced if retraining is to be effective.

Also needed at the adult level are better facilities for counseling, guidance, and placement.

There is no doubt that retraining is taking place. For example, in 1961 Ford retrained nearly 3,000 workers to handle advanced equipment. General Motors retrained 7,200, in addition to its apprenticeship programs, and Xerox, a comparatively small company with less than 2,000

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workers, retrained 68 of its older employees in an intensive course in machine shop techniques, so that as their jobs disappeared they could be transferred to other sections. This is but a mere beginning. Most small companies will have neither the funds nor the facilities to undertake large scale retraining. Therefore it will become the responsibility of the educator backed up by government agencies.

G. *The Education of the Underprivileged Child.*

In our analysis of dropouts and reluctant learners we came to the conclusion that a large percentage come from areas, which when compared with the statistical norm, are found to be wanting from the cultural, social and economic viewpoints. Here, we will merely summarize some of the findings of our analysis with the addition of certain recommendations which were omitted earlier.

I. *Pre-school Program.*

For proper development, physical and mental, the child must have good health based on correct food, exercise, play rest, sanitation and medical care. Emotional growth must be fostered by giving sufficient love and attention and the gradual taking of responsibility. Positive attitudes toward the school must be cultivated.

Where the parents are not able to fulfil the above requirements social workers and specially trained teachers must do so. Day nurseries should be set up in sufficient numbers to aid both the working mother and the non-working mother who can not meet the requirements outlined above.

Among the facilities to be provided by the nursery are: medical check-ups, free lunches, group play, books, pictures, stories, music, individual attention, equipment in the form of mechanical projects which do not need verbalization. Great pains must be taken to help these children to express themselves verbally through simple storytelling and dramatics. One can imagine some of the results of such

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a program when one reads of the results of Operation Headstart—a program in operation for a mere eight weeks.

We observed the result of parental interest and concern in the the child's school work, therefore, it is essential that active *parental cooperation* be obtained. Where parental attitudes to education are negative, psychotherapy might be instituted.

2. *The Teacher.*

The teacher must be dedicated to helping these children but it must be remembered that the dedicated man does need a good salary. The teacher in this area will have more responsibility in planning curriculum and gaining parental support for the school and consequently should be paid *more* than the normal teacher. It is a misconception to believe that a good salary will recruit the "wrong type" of teacher. Good salaries are needed to recruit male teachers, of whom there are too few. The child needs to come into contact with good male teachers as well as females if we wish them to identify with good models. The teacher must have faith in the ability of these children to learn and create and must have a respect for them and learn to see the positive values of the lower class culture rather than being blinded by the apparent negative values.

3. *Smaller Classes.*

Small classes are essential for the teacher to give enough individual attention to each child. He must get to know the child's capacity and tailor a program which will stimulate that particular child to develop to his potential.

4. *Extra Funds Needed.*

Since the school will have to supplement the culture imparted in the home, extra funds must be made available for this. This supple-

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mention must continue throughout the school years and later by adult education programs.

5. *The Use of Positive Reinforcement.*

We pointed out earlier that it is essential to give the child the feeling of accomplishment if he is to continue learning. The curriculum must be designed to give maximum opportunity to succeed so that intrinsic interest may develop. Programed instruction will help in this process. Sub-goals must be worked out, to be achieved at short intervals, since these children have greater difficulty than middle-class children in working for remote goals.

6. *Curriculum-Special Considerations.*

We noted that a large percentage of dropouts were uninterested in school work mainly because it was found to be irrelevant to their present life and interests. The curriculum must be in tune with these factors. It is feasible to build a program around comic books, magazines and commercial television in order to arouse interest. Much can be done in using the pupil-teacher planning approach with parent participation to work out a curriculum which they feel to be worthwhile and stimulating. The curriculum should emphasize, as far as possible, the concrete, the active, the practical and the dramatic. Better results will come from the manipulation of combination of abstract and practical activity rather than pure abstract activity. Full use should be made of excursions and visits to the school by successful members of their own group or class who have "made-it"—in order to develop the attitude of "If he can succeed-well, I can, too."

We saw, too, that it is essential to develop exploratory behavior: therefore the curriculum must be designed with the optimal combination of family and novelty.

There must also be the opportunity to develop self-knowledge

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which will lead to insight into motives and the change of self-concept necessary for higher achievement motivation. Group psychotherapy, under another name, would be great value. Attitudes will often be expressed in the group session which the individual would find difficult to express and accept in individual therapy.

7. *The Peer Group*

Since for the lower class child peer-group approval is more important than adult approval (to a greater extent than with middle-class children), it is essential that the school win over the peer-group. The child will continue to strive if what he is striving for has peer-group approval.

8. *The Desire for Independence.*

The adolescent finds himself in a no-man's land, where he is neither a child nor an adult. He desperately desires the independence which, he feels, comes with taking a job. In many cases the answer to the question of whether he should start work or stay at school can be solved by a combination of work and study. Some schools have successfully experimented with this type of program. It is essential that close cooperation be maintained between school and place of work if it is to be run efficiently. Using this program it is possible for the boy to gain a feeling of independence and at the same time appreciate the school for its aid in developing his skills and knowledge. Ideally, the employer should require the boy to learn the next level of skill which is to be based on work done at school. In this way the relevancy of school work is recognized by the boy.

9. *The Need for Social Reforms.*

The school can deal with only one part of the problem. The child will not be motivated to learn, no matter how good the school

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program is, if the child knows that he will have little chance of using his skills or little chance for advancement. Many children from deprived areas feel that barriers of discrimination and prejudice block all avenues to highly paid and responsible jobs and this is, indeed, often the case. Thus, the problem is two-fold: a) motivating the underprivileged to aspire to skilled jobs, and b) motivating the favored and influential classes to eliminate unnecessary limitations on the development of a large number of the nation's youth.

The problems we have been considering are well illustrated in an article dealing with the problems of Negro cotton pickers in the Delta area¹⁾. We have the problem of automation putting them out of work: "With technological progress far more to blame than racial prejudice, up to 20,000 Delta Negro farm laborers are expected to be idled this cotton season....."² and ".....machines-not men-will pick 95 percent of this year's crop....."³ Practically no retraining programs have been helping these displaced workers adjust to the new demands of life. Last week (March 1st, 1966) a thirteen-county literacy and job-training program was set up. For many workers this program has come too late since the Saturday/Sunday routine is already setting in where they have given up hope. "The problemis that people around here don't think there is any chance for them, and it's probably too late for the government to move now."⁴⁾ Discrimination tends to increase their feeling of helplessness. Another important project, Operation Head Start, was recently pushed through over ".....pro forma protests by Mississippi's Congressional delegation."⁵⁾ This program is vital in helping to make up for lacks in the child's cultural environment. Unfortunately, this program is still in its infancy and it will be many years before it shows concrete

- 1) "Secret Crisis in the Delta", *Newsweek*, Vol. LXVII, No. 10, March 7, 1966, pp. ff.
- 2) *Ibid.*, p. 19.
- 3) *Ibid.*, pp. 19 and 20.
- 4) *Ibid.*, p. 20.
- 5) *Ibid.*, p. 20.

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results. Still, it is a step in the right direction and must be extended as quickly as possible. The "Delta Touble" is a combination of: the effects of automation; the lack of foresight and planning; the lack of social reform; and the results of a faulty education system.

H. *Grouping and the Area of Challenge.*

For many years it has been our custom to group children by age but since within one age group there are great variations in mental capacity and physical and social maturity it would seem that the use of the arbitrary age factor for determining to which group a child belongs is of no more utility than grouping children by the length of the nose. Fortunately, this has been recognized in some areas and

Table 6. Compulsory and Permissive School Attendance Ages
in Selected States. (1)

Name of the State	Compulsory Age	Permissive Age
Ala.	7-16	6
Ariz.	7-16	6
Calif.	8-16	5-3/4
Colo.	8-16	6-21
Fla.	7-16	5-3/4-21
Mich.	9-16	5-21
Nebr.	7-16	5-21 (2)
N. Y.	7-16	5-20 (2)
Pa.	8-17	6-21 (3)

- 1) *State Legislation on School Attendance*, U.S. Office of Education, January 1, 1960, pp. 17-31.
- 2) School attendance is permissive between the ages of 5 years and 7 months to age 8, but if admitted, then compulsory school attendance applies. School boards may admit children at the age of 5 if such children have a mental age of 7.
- 3) Wellington C.B. and J., *The Under-achiever: Challenge and Guidelines*, 1965. The authors deal in great detail with the state of mind; personality; aspirations and social environment of the under-achiever.

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children who are ready for the school experience are admitted at an earlier age than that required by the law of the State. Also the child may continue in school well beyond the compulsory school attendance age. Table 6 gives us some indication.

Thus, we see that a child may be admitted to school if he has the capabilities.

The idea that children should be compared with those of their own age group is a false and harmful idea to harbor, since how can children starting off the "race" with such different capacities, interests and background be expected to compete on equal terms?

It has often been suggested that children should be grouped on the basis of I.Q. within a certain age group. This has advantages over grouping merely by age but it has decided disadvantages. One of the main criticisms leveled against this type of grouping is that one often finds a number of under-achievers who do not achieve the standard promised by their potential. The Wellingtons have made a very thorough study of the under-achiever and his problems.¹⁾ This same problem applies to grouping based on academic achievement.

The proponents of the heterogeneous class maintain it is to the individual student's advantage that he be educated along with other children whose intellectual capacities range from the so-called "dull normal" to perhaps the "superior". They maintain that the superior student will benefit from the opportunity to "socialize" with the average and dull normal and will come to understand and accept them. We have insufficient research data to back up these fond desires of the educator. We may be able to prove that he is more tolerant of the average and the dull student. We may also be able to prove that the superior student does try to fraternize with the average students who make up the bulk of the class, but who is to say to what extent fraternization is merely a desire to avoid seeming "superior" or

1) The child may be admitted regardless of age if it has completed one year of kinderten.

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abnormal and to what extent it is based on true friendship?

As stated earlier in this paper, research bears out the old saying that "Like gravitates to like"—that is, that those having *similar* attitudes and interests and abilities will tend to be friends, and towards those *unlike* themselves they will tend to feel either tolerance, indifference, fear, superiority or some combination of these feelings.

The belief that the superior students will act as a spur to the other students in the class is a fallacy because they will quickly realize that they have no hope of emulating the superior and will continue on as before or worse still—almost give up or do just enough to get by since they know that they can not attain academic honors. To say "Ah!, But they can gain recognition in other fields, such as in sports or dramatics", is to miss the point. As soon as they realize that they can not "make it" in academic subjects there will tend to be an easing off with regard to effort in that field. This may increase if they find it necessary to concentrate more effort in another field to gain recognition. How often have we heard expressions similar to this?: "Oh! John, yes, he's pretty dumb in school but you should see him play baseball—man, he never misses a game". Hence, we often find a complete lack of balance between academic and non-academic activities which has been more or less forced on the child by the education system, if we admit, as we must do, that the child has a psychological need for recognition and approval. The older the child becomes, the more important peer group recognition and approval becomes, to the detriment of parent-teacher recognition and approval.

The time has come for us to stop deceiving ourselves that everybody is equal and therefore to stop trying to provide an education which will make this into a reality. Our attempts to do this result in a lot of mediocre graduates since we attempt to raise the dull-normal up to normal and inhibit the development of the superior by making him study along with the normal. Where there are cultural deficiencies

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they must be made up as soon the possible at the kindergarten stage, if not before. There should be *equality of opportunity* for each child to develop to his *maximum potential*. This does not mean that all children should go through the same curriculum far from it. The curriculum must fit the child not the Child the ideal of equality of opportunity. Needless to say education must be free and those who would drop out of school due to financial obligation must be aided. Funds will have to be made available so that a high standard in school buildings, equipment and teachers may be maintained to eliminate such appalling deficiencies as the present exist in some of the Southern states and underprivileged areas.

Automation is forcing upon us a new type of grouping—one in which automation itself, can play a large part. This grouping is to be based on the psychological area of challenge.

We defined area of challenge as that area of study “.....which is difficult enough to be stimulating yet not so difficult as to preclude success”.¹⁾

It is possible to work out an area of challenge for an individual within a certain field of study but a great many tests are necessary and since the individual is dynamic rather than static, this area of challenge will be constantly changing. The area of challenge may be determined after computations are made involving the level of motivation; social and psychological maturity; past achievement; emotional balance; expectation of success, interest in the subject matter, mental capacity, ability to manipulate abstract concepts and attention span. This data could then be fed into a centralized computer which had previously been programmed with teaching materials. It would then be possible to select teaching materials either in the form of texts or programs (either in machine or book form) within the area of challenge of that particular individual. His progress though the materials would be fed back into the computer which would make any

1. *Vide* “Area of Challenge” Section IV E. 5 c.

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any necessary adjustments and inform the teacher of alterations to be made in the individual's curriculum. The teacher would receive information as to whether the student needs encouragement, a short rest, a different approach or help in a specific area. Using one master computer the teacher will be able to provide tailor-made instruction for all his students and will be able to give individual attention to any problems the student may have. If the students are grouped by area of challenge, both machine and teacher can be used most effectively. In the ordinary class the teacher talks "over the heads" of the slow students and bores the bright. Teaching machines and programmed texts may also create problems in the heterogeneous class since the slow be greatly discouraged at his rate of progress compared with that of the bright student. Needless to say, this type of grouping would not be across-the-board grouping. For activities such as music, P.E., art and sports there would be a general mixing of students; also while John and Peter may be within the same group for English they may be different groups for mathematics etc. Though the value of the "home room" has been much debated, it might, if properly organized, be of value in bringing about a feeling of belonging.

Much of what was said earlier in the educating of the under-privileged child also applies to the normal so we will not dwell on those common aspects.

If the above program were adopted, it would be possible to develop intrinsic interest, encourage exploratory behavior and give each child the necessary reinforcement of success. These factors, basic to the development of flexibility and the continued desire to learn are, as we saw earlier, the most important characteristics which automation demands of man. It is not difficult to foresee the development of such a program within the next few years providing that educators wake up to the urgent need for change in the education system and that sufficient funds are made available to meet the enormous costs which the changes will entail.