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New Year
Greetings
to
our Readers
and
Contributors*

★
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EDUCATIONAL INDIA

Re-structuring of Education

By

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RECENTLY the 10+2+3 has become the focal point in the educational discussions and conferences. It is a radical reform of education and equips it with a purpose. The educational policy of 1968 has rightly clarified this new pattern and emphasised on two points, i.e. provision of educational opportunities to all, and application and expansion of technological knowledge with the inculcation of ethical and social values consistent with the social change envisaged.

The knowledge explosion and the application of technological know-how has widened the possibilities of richer, fuller and better living conditions. In all the developed countries efforts are being made to reorganise their curricula to make education more realistic and related to social conditions. After the second world war the re-organizational efforts have been given a new vigour and turn. Important considerations have been; firstly, to organise education to provide a mini-

mum essential quantum of knowledge, skill and ability which shall enable the individual to adjust in the changed conditions of social, political, economic and psychological aspects of life. This involves provision of General Education upto certain age or stage. Secondly, to enrich the content of the basic essential knowledge. This is being done by Inter-disciplinary approach to curricular construction.

In any national system of education the Secondary stage must stand to the demands of being firstly, terminal—providing skills, knowledge, abilities and values to fit in the individual to various jobs, secondly, it must prepare the child for various professional courses and provide the fundamentals for specialization. Judging the new pattern from this point of view, one finds, it contains these two qualities.

Switching over to this new pattern, naturally involves certain organizational problems. For instance the success of this pattern depends on

the proper organization of the +2 stage. This stage seems to be the vital stage in the restructuring of education. First and foremost question is where this stage is to be attached? Should it be an enlargement of the school? or attached with the Universities or Colleges? The Educational policy of 1968 and the Education Commission have left this decision to the local conditions. But as it is, it must go with the schools, where the conditions are favourable, judging from the point of view of the resources available with the schools, buildings, teachers, their professional and academic qualifications and lastly the possibilities for imparting instruction in specialised vocational courses. Plus Two stage with all the vocational courses would infact present a picture of a big complex. Care should be taken to provide for +2 stage separately. In certain provinces the present secondary stage has eleven classes and in enthusiasm to switch over to 10+2 pattern the danger is that one more class would be added to existing XI class. This shall not serve the purpose. The provincial administration shall have to evaluate the conditions in the schools and if found suitable then only steps be taken to open the 12th class. Major consideration should be on how best—vocationally, academically and educationally the plus two stage be organised.

Another practical problem plus two stage would present is the introduction of specialization in vocational courses. It shall not be possible to have all the vocational courses in any one school. The plus two schools can be divided into categories, namely comprehensive, uni-lateral, bilateral and Multi-lateral where provisions for one, two or more than two and many diversified specializations be ruu. For doing so, considerations for

resources, management and instructional facilities be given, besides, the area where the schools are to be located must be evaluated. Rural and urban are the main divisions of the areas but care should also be taken to categorise the areas into Industrial, semi-industrial and non-industrial. Apart from this, there might be certain areas where the possibilities of industries and trade might be rampant or can be assured but no undertaking or enterprise has developed. In such areas suitable vocational courses can be introduced and encouragement to such vocations can be given.

To make the plus two stage more effective and purposeful, it is better to associate this stage with undertakings of trade and commerce and vocational centres already developed in the respective areas. This association shall serve two purposes—firstly, the provision of 'Skill Models' for imparting specialised instructions and secondly, scope for experimental learning to make this stage too much institutionalise would mar the above two purposes on which the success of it depends. It shall be a mighty problem to provide the 'Skill-Models' in the class in the form of teachers and also difficult to make the learning situations in the institutions— Experimental. This is possible but at the cost of great expense. Association of this stage with actual vocations, trades and commerce would minimise the institutional burden both of administrative and fiscal nature. The students can very well complete their assigned units in the field of specialization on the spot with persons and things on the jobs also, come back to the institutions for their lecture units, direction, discussions and exchange of experiences. Thus, Semi-De-Institutionalisation, of the plus, two-stage and association of the 'Alternatives' would

be involving of the whole of society and making it more fruitful.

Another issue which involves the new pattern is the channelizing of students to different specializing courses. As the provision is, the examination after 10th grade would open two openings — one, two-year academic course leading to University education and the other—two or three years of vocational courses leading to higher specialization. It is just possible that a boy may not give the required performance at this examination and may miss the chance for either to go in for specialization or academic courses. In that case he may not opt for the field of study of his choice. There we feel the provision of certain standardised tests which would evaluate his interest, aptitudes and ability for specific vocations. These tests can be administered side by side of the 10th grade examination and thus divert the boy for the specific courses. At this stage there also comes the need of parallel institutions catering for such boys who fail to show up the educational and professional efficiency. Such +2 stage institutions run by 'alternative' arrangements outside the fold of 10+2 pattern may serve a vital purpose. Such institutions developed on 'Non-formal Education' lines or evening classes or continuing education can be encouraged. The bulk of this enterprise can be shared by private individuals, undertakings and houses of commerce, trade and industries.

These institutions shall be serving double purpose. Firstly, they shall be coaching & preparing students who had fallen out after 10th grade examination and after one year's education, prepare them to take

standardised tests or other qualifying examinations, on the basis of which they can enter into institutions of higher learning, in vocational courses or academic studies. Provision for such 'late-developers' will have to be made after the 10th grade Examination. This 'late-developers' Exam. can provide credits to the students for transfer from one stream to another without the loss of their time. Secondly, these +2 Institutions shall be preparing students for Higher Secondary Examinations. This alternative arrangement at +2 stage shall minimise the strain otherwise caused on the Government.

Over all, the success of the 'job-oriented Education' depends upon the 'Job-providing-structure' of the society. This new pattern of education naturally calls for the creation of demand for specialised personnel at various levels and of various grades. State alone can not take the responsibility of creating the demand. For this different sections of society will have to come ahead with this demand. Proper incentives need to be provided to make the ends meet.

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Vocational Education in Ancient India

By

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IN early days, the vocational instructions were given to the sons by their fathers and were confined to duties of their particular calling in life. The Caste System obviously played a very decisive role in early vocational education and training. The Brahmin youth was prepared for his future vocation as a priest and a teacher, and much that he would be required to know would not only be useless to the youth of the other castes, but it was unlikely that the Brahmins would communicate all the duties of their priestly office to others. In the same way young Kshatriyas and Vaisyas received training in their particular calling in life, and their education was more and more concentrated on those subjects which had a direct bearing on their future calling. Even the Royal Princes were expected to be acquainted with instructions about their duties and had to be proficient in the science of politics. A knowledge of the use of arms and of military skill was, of course, necessary, and a great deal of the time of young Kshatriyas must have been given to learning their duties as warriors.

The 'Arthashastra' of Kautilya gives us a detailed picture about the education of the young prince. It

also shows how the science of politics developed at that time. It also contains a detailed account of the duties of the kings. Even in the Law of Manu, we find that the king was required to learn the science of dialectics and the supreme Soul and also he should learn the theory of various trades and professions from the people. The idea that the kings and the nobles had a duty to perform to society in the protection of the work was very prominent.

With regard to the Vaisyas, trade, rearing cattle and agriculture were their special pursuits. The Vaisya was also required to know about the gems and pearls, quality of cloth or perfumes etc. The young Vaisyas were not only required to have some knowledge about agriculture but also the knowledge of commercial geography, arithmetic, languages as well as practical details of trade. Most of this knowledge was gained at home i. e. learnt from the father and later on in the actual course of business.

In the ancient Indian literature there are many references to trade-guilds and it is likely that they had made some arrangements for training in the required subjects under a teacher. We also hear about Maha-

jani Schools in many market towns where the Mahajans or traders must be paying for the teacher.

Medical Studies

We also read about the medical studies at the University of Takshasila. A Greek writer, Strabo, praised the efficiency of the Indian practitioners. The medical courses included practical training both in surgery and pharmacy. Special attention was given to antidotes for snake bite. The text-books were in Sanskrit; surgical methods were thoroughly taught. India was famous for its medical skill down to about 9th century A. D. The Khalifa of Baghdad, Harun, sent men to study medicine in India and induced Indian doctors to come to his capital. Also Sanskrit medical works were translated into Arabic. Medicine was also taught in the famous Buddhist University of Nalanda.

The care of animals necessitated the attention to vaterinary science. Asoka provided some medical help for the dumb creatures.

As time went on, the original castes of the early times became greatly divided and sub-divided. In course of ages, the number of castes became numerous and specially all those engaged in particular occupations became separated from others as castes and almost all followed the professions or trades of their castes. Obviously, the technical and professional skill developed in each caste was passed on from generation to generation.

India is a land of villages. Each village is more or less a self-contained agricultural community. But in the village dwell the agriculturalists and also certain artisans. These villages were the strongholds of the traditionally arts and crafts of India, but

many of the craftsmen lived in towns.¹ Here those employed in the same occupations were drawn together into craft guilds. Though membership was hereditary, newcomers were admitted by paying certain fees, but no unqualified persons were allowed to remain in the guild, or to become a member of it. There were no indentures of apprenticeship, but a boy born in one of the castes learnt the particular craft from his father, and eventually took the place of his father as a member of the guild. The guild controlled the standard of quality. It was like a kind of mutual assurance society.

In ancient times the arts and crafts were encouraged by kings and great nobles, and many of them kept their own craftsmen who were organised on a semi feudal basis. Sometimes they were in the service of a temple or a monastery. Royal craftsmen are said to have been established even as early as King Ashok.

Many of the Mohammedan rulers were great patrons of the craftsmen. One of the developments during the Muslim period was the establishment of a number of institutions for training in arts and crafts. In earlier days, such arts and crafts were generally taught by father to son as part of the family tradition. Also, some form of apprenticeship was not altogether unknown.¹

The establishment of the Sultante in Delhi led to a situation where the old arrangements were no longer adequate. The king had to maintain number of workshops (Kharkhanas) to supply the needs of the royal household and the government departments. Firoz Shah Tuglak maintained

1. Humayun Kabir. 'Indian Philosophy of Education,' Asia Publishing House, Bombay, 1961, P. 190.

a regular department of industries under his personal supervision and took keen interest in the technical training of his slaves. During his time (Ruled 1351-1388), some of the workshops were also converted into institutions for vocational training. Of course, the majority of the trainees were Muslims. This partly explains why for centuries in some crafts the skilled artisans are Muslims. Akbar also organised a new public works department and himself occasionally inspected workshops. Sir Thomas Roe is a witness that under Jahangir and Shah Jahan Arts and Crafts were thriving.

In short, the system of vocational education for the youth of each particular trade was a domestic one. They had practically no choice in the matter, but as a matter of course, were brought up to the same trade as their fathers. Thus, the young craftsman was, from the beginning, trained in the actual workshop. Thus not only was there a most affectionate relation between teacher and pupil, but the training was free from the artificiality of the school-room. The boy was taught by observing and

handling real things, and the father would take a great delight in passing on to his son the skill which he himself possessed. It was not merely a question of acute training or teaching, but the boy would day by day absorb unconsciously the traditions and spirit of the particular craft which he was learning.

But this type of education was often too narrow. Though the religious sides of the boy's education was not neglected, on the literary side, it was defective. Yet as a vocational education, it was not lacking in elements that made it really valuable. The affectionate family relationship between teacher and pupil, the absence of artificiality in the instruction, and the opportunity and encouragement to produce really good work, which the protection of the guild or caste gave—these were not without their influence in helping to build up a spirit of good craftsmanship, which was responsible for the production of really fine work.¹

1. Keay, F. E. 'Indian Education in Ancient and Later Times.' Oxford University Press, London. E. C. 4. Page 71.

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Organization of Audio Visual Education Programmes

(Teachers' Training Colleges)

By

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The place of A. V. Education in Training Colleges :

WE are living in an age where science and technology is exploding. Knowledge is ever increasing. On the other hand, we observe enormous population growth. That means we have to give more information to more pupils and in less time. This is one task. On the other hand, we have to think of developing the various abilities of children. This in turn demands rich and varied experiences to children.

In the educational process, teacher plays a vital role in developing the abilities of children by providing varied experiences. This is possible to a large extent by using different modes of presentation. Teaching will be effective and worth-while if he uses different Audio Visual Aids. He should also be aware of modern methods and techniques of using various types of aids. No doubt Audio Visual Aids alone cannot accomplish the task of education. Visual Aids when properly utilised helps the teacher to bring out the desirable changes among children.

So a teacher needs elementary theoretical knowledge of Audio Visual

Education and the mode of presentation of Audio Visual Materials and the utilisation of the same properly. He should also be aware of the various techniques of preparing simple and inexpensive materials.

So sufficient preparation of a teacher in training colleges to develop the various skills involved in preparing, using and maintaining Audio Visual Aids is essential. It is given below how to organise the Audio Visual education Programmes in Teachers' Training Colleges.

The need for effective organisation :

The A. V. programmes include not only the theoretical part of graphic and non graphic aids, but also the practical aspect of preparing various types of A. V. Aids and the effective use of the same in the class room situations. The programme also includes handling the A. V. equipment and making use of the equipment in class teaching. Naturally this entire programme needs effective organization from the beginning of the academic year of the B. Ed. course.

We should remember that more stress either in the beginning or in the end leads only to confusion and

frustration among trainees. The trainees should feel the need to use A. V. aids in class rooms. So proper atmosphere should be created from the beginning of the year and suitable learning experiences should be provided so that learning will be effective. To develop various skills among the trainees in the preparation and use of A. V. aids, careful planning is very essential. This naturally demands a very effective organization of the entire programme.

The organization of the programme may have the following stages. *Staff Council*: The A. V. Programme will be drawn in consultation with the staff council. The members of staff are at liberty to give suggestions for implementing the programme.

A. V. Programme needs a combined co-operative effort on the part of the staff. Every staff member should be involved in the programme. Every lecturer should take one practical aspect and should be in charge of their duties in the beginning of every academic year. One lecturer who is having a better knowledge of the entire programme should act as Co-ordinator. The Co-ordinator is responsible for the overall A. V. Programme.

First Stage: In the first stage the trainees will be given some training in developing some fundamental skills in lettering, picture manipulation, preparation of charts and preparation of hand made slides. This initial training will help the teacher trainees to prepare a few necessary aids during their preliminary teaching. To organize this programme the entire class will be divided into four groups consisting of 20 to 25 students depending upon the total strength of the college. This group system will continue till the completion of A. V. programme.

On every working day 1½ hours are set apart in the afternoon preferably from 3-30 P. M. to 5-00 P. M. If the trainees in the group feel to work more, to complete the assignment taken, provision will be made to continue their work even after 5-00 P. M.

The college reopens usually in the 3rd or 4th week of June. The first two weeks will be set apart to orient the trainees to the entire teacher training programme. A situation will be created through lectures and discussions where trainees feel the need to use different methods and techniques of teaching. Once the trainees are convinced the need to change methods of teaching then naturally it follows what are the various learning experiences that the educators can provide for effective teaching. This providing various learning experiences demands the use of various types of instructional materials. During discussions the importance of A. V. aids will be brought in. The month of July can be completely utilised for developing the basic skills in preparing graphic aids etc.

If trained teachers are not available the management of the college can utilize the services of a technician or an art master working in the neighbouring schools.

Suggestions: The programme concentrates only on a few items of A. V. aids. In addition to lettering technique, picture manipulation etc. the following items may also be introduced.

- a) Preparation of posters.
- b) Silk screen printing.
- c) Preparation of various types of models.

The above items can be clubbed with the previous items. For exam-

ple preparation of posters can be clubbed with the preparation of others etc.

II Stage: After having acquired some fundamental skills in preparing some projected and non-projected aids some training in handling the equipment is needed. The training may be of a general nature. The following are the various steps involved in the second stage.

a) Demonstration by concerned lecturers in handling the equipment.

b) Practice by the trainees.

c) Evaluation in handling the equipment.

d) Consolidation of marks and submission of the same to the Principal.

One lecturer will be in charge of one type of equipment.

A few suggestions: The programme does not include handling the epidioscope and overhead projector. These two items may also be included as they also play an important role in A. V. media. These two items can conveniently be included with tape recorder and public address system.

With a general background of graphic and non-graphic aids and handling the equipment the trainees will go for preliminary teaching in schools. During this period if they find it convenient to prepare different A. V. aids they should be encouraged by the educators. If the educators stress from the beginning to prepare the aids, probably they may give under-importance and neglect for the remaining period. So the trainees should feel the need to use the A. V. aids. At this stage, encouragement is necessary to prepare a few aids and use in the class room situation.

In the above discussion nothing was mentioned about photography. In educational technology, photography occupies a very important place. If the teachers are able to produce their own filmstrips, photographic slides, etc. they become very good media in teaching. Even though the initial cost is much, on mass production this photography becomes cheaper. Having realised the importance of photography how far it can be introduced in teachers' training colleges is a question which needs careful study. Where the government can provide facilities for photography the principal should not hesitate to introduce the same. A general background of photography may be given through two or three lectures with practical demonstration on (1) How to handle the camera (2) How to develop and (3) the process of printing. Depending upon the facilities the practicals may be organised in the month of August during which period the trainees will be engaged in preliminary teaching. Thus without affecting the general academic programme the photography with theory and practicals can be introduced.

III Stage: The intensive teaching practice generally commences in the month of November and December. Prior to that the subject specialists can take up the A. V. education programme in their respective classes. Now it is left to the optional subject teachers to train the trainees in preparing and using the A. V. aids in their respective subjects. The trainees may be allotted different units and may be instructed to prepare a set of aids. This method of confining to a particular unit helps the trainees to understand the various possibilities in preparing and using A. V. aids. The following aids may be prepared in each unit.

(1) Chart-Table chart, Tree chart, Flow chart, Flip chart.

- (2) A set of flash cards.
- (3) A set of handmade slides.
- (4) Improvised aids (one or two).
- (5) 3-Dimensional models.

Individual exhibitions: (Exhibition arranged by one trainee with the aids prepared by him.)

Healthy competition should be provided among the trainees in preparing various types of aids. Individual exhibitions may be arranged and the lecturer can make use of this opportunity to discuss the educational values of such aids and how to use the same in a classroom situation. After a few individual exhibitions all the aids prepared may be consolidated and a group exhibition may be arranged. These types of exhibitions naturally help them to understand the educational values of such aids and motivate the trainees to use the various aids that they prepared during their intensive teaching practices.

IVth Stage: After the intensive teaching practice the trainees will have a good knowledge of various types of aids and their educational values. Somewhere in the month of January the trainees should be motivated to use A. V. Equipment in a classroom situation. A combination of preparation of aids (e. g. Handmade slides) and effective use of the same in the classes help both the teacher and the student. To achieve this purpose the programme may be drawn as follows. The following items may be introduced.

- (1) Film lesson.
- (2) Filmstrip lesson.
- (3) Radio lesson.

In addition to the above, a fourth type of lesson may be introduced, that is taking a lesson with handmade

slides and using epidiascope. The number of types of lessons will be:

- (1) Film lesson using film projector.
- (2) Filmstrip lesson using Filmstrip projector.
- (3) Radio lesson using public address system.
- (4) Handmade slides lesson using epidiascope.

The following are the various stages involved in organising the programme.

- (a) Demonstration by the concerned lecturers.
- (b) Selection of films or filmstrips by the trainees according to their subject.
- (c) Preview of the films or filmstrips.
- (d) Teaching practice by trainees.
- (e) Evaluation and consolidation of marks.

As in the previous case the class may be conveniently divided into four groups.

Vth Stage: A trainee passing through the above four stages will definitely have a sound knowledge of A. V. Education programme. This enables him to become a good teacher. In the month of February, the trainees may be instructed to prepare a term paper selecting any topic they like. The lecturer concerned can give necessary guidance in selecting a topic. The lecturer can select a few topics which he feels best for discussion in the class. After discussion the lecturer can consolidate the term papers for further research by the new trainees.

Depending upon the facilities available the training colleges can think of such a pattern of organization of A. V. Programme in their respective colleges.

Development of Women's Edn. in New Madhya Pradesh

By

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"THERE cannot be an educated people without educated women. If general education had to be limited to men or women, that opportunity should be given to women, for then it would most surely be passed on to the next generation."

The importance of women's education cannot be denied in any country and at any time. Due to a number of reasons peculiar to India, it could not make progress here for a long time in the past. The main difficulties in the way of women's education were systems of purdah and child marriage, indifference of parents towards education of their daughters, lack of faith in the western system of girls' education, economic pressure on middle-class people, and so on.

The State of Madhya Pradesh remained still more backward in this respect due to social, political, economic, natural and physical reasons. More than 80 per cent of the population of the State being rural population, including nearly 20 per cent of the Scheduled caste and Tribal people

living in the far interior of the forests, there is considerable backwardness and lack of awakening among people.

Also, due to the illiteracy, orthodox and comparatively greater poverty in the State, the education of women could not make much progress in the State. According to the census of 1951, the percentage of literacy in women was only 3.2 in Madhya Pradesh. In the year 1971, it was raised to 10.84 per cent. The efforts to bring women out of this darkness of ignorance were started after the achievement of independence. They were made more vigorous as planning for progress in various fields of life was started by the people.

As a result of the increasing national awakening and greater social reforms, the pace of progress of women's education increased in Madhya Pradesh. After the reorganization of the State, the progress made in the field of women's education between the period 1956 and 1974 is as given below :

TABLE — I
PROGRESS OF WOMEN'S EDUCATION IN MADHYA PRADESH
1956—74

ITEMS	1956	1961	1964	1974
No. of Girls' Higher Secondary Schools.	64	106	186	253
No. of Middle Schools.	154	210	489	788
No. of Primary Schools.	1,389	2,000	2,405	2,921
Enrolment in Girls' Higher Secondary Schools.	7,074	11,000	.29 lakhs	80,789
Enrolment in Middle Schools.	26,274	54,000	.86 ,,	1,78,995
Enrolment in Primary Schools.	2,46,324	4 lakhs	6.66 ,,	10,03,258

At the primary stage, the schools are mostly co-educational; hence separate schools for girls were not stressed except in the case of certain places in rural and a few in urban areas, where the demand for separate schools for girls was made by the people even at the primary stage. Apparently the expansion of

schooling facilities for girls at all the three stages between the period 1956-74 appears to be satisfactory, but when compared with the figures at the national level, or those of the other sex, a great disparity is found. The following table gives a picture of it.

T A B L E — II
COMPARATIVE STATEMENT OF ENROLMENT OF BOYS AND GIRLS
1973 — 74

ITEMS.	GIRLS.	BOYS.	Girls at the National level.
Percentage of Enrolment at Primary stage	31 %	82 %	61.6 %
Percentage of Enrolment at Middle stage	8 %	35 %	16.5 %
Percentage of Enrolment at Higher Secondary stage	3 %	17 %	6.9 %

The above table indicates the disparity found between the percentage of the enrolment of boys and girls and girls at the national level. When the above percentages of the enrolment of girls at various levels are compared with the percentages at the national level, which are 61.6 per cent at the Primary level, 16.5 per cent at Middle school level and 6.9 per cent at Higher Secondary level, they fall far short of the achievement. This means extra efforts are needed to speed up the pace of women's education in the State.

New Schemes of Development under the Five Year Plans :

To promote education of girls at the Primary and the Secondary stages, efforts were made by undertaking the following new schemes of development under the Fifth Five Year Plan.

1. Construction of quarters for teachers. Under this scheme, 18

quarters were constructed for lady teachers.

2. Construction of High and Middle School Hostels. Under this scheme, besides completing the work of construction taken up during the Fourth Plan, 24 girls' hostels were to be constructed under the Fifth Five Year Plan.

But these minor schemes of development were not sufficient to bring about any improvement in the State for women's education.

In order to promote women's education in India 'The National Council for Women's Education' was established at the Centre in the year 1958. On the recommendation of this Council 'State Council for Women's Education' was constituted in Madhya Pradesh in the year 1960. It consists of both the official as well as non-official members from among the women of the State.

There are in all 21 members in it, excluding the Chairman. It advises the State Government, on matters connected with women's education, and recommends measures for the expansion and progress of women's education in the State.

On the recommendations of the State Council for Women's Education, the following steps were taken by the Government for the development of women's education in the State during the Fifth Five Year Plan :

1. Raising the targets of girls' enrolment at various stages of education : They are 43.8 per cent at the Primary Stage, 6.7 per cent at the middle stage and 1.5 per cent at the Secondary stage of the population of age-groups 6-11, 11-14 and 14-17 respectively.

2. Chalking out special programmes to give greater incentive to girls to enrol themselves in schools : These include attendance, scholarships, stipends, free uniforms, books, mid-day meals, hostels, etc. A provision of Rs. 44.50 lakhs was made for carrying out the special programmes for the education of girls and women in the Fifth Plan.

3. Increasing the number of women teachers especially in rural areas. Special measures taken for this were, the opening of new training institutions for women, financial assistance to girls from rural areas to take up training, relaxation of qualification and the age limit for selection in training and the advantage of five advance increments to trained and three advance increments to untrained women teachers.

4. Provision of residential quarters to lady teachers as far as possible in rural areas : With a view to solve the problem of accommodation for

women teachers, a number of quarters were constructed during the Fourth Five Year Plan. There is a provision for constructing more quarters during the Fifth Five Year Plan.

With the above mentioned efforts, it is expected that women's education will, make further progress in the State in the future.

Conclusions :

1. A large per centage of girls at Primary, Middle and Higher stages of education are out of the school.

2. The facilities of schooling for girls at all stages are inadequate.

3. There is a great disparity in the enrolment of boys and girls at all stages of education.

4. Both the Government and the people are indifferent to women's education,

5. There are two main problems in girls' education requiring serious attention :

(1) to increase enrolment of girls in schools, and

(2) to increase supply of women teachers.

6. All the general and the special programmes chalked out for the improvement of girls' and women's education are not properly carried out. Economic backwardness, traditional resistance to the girls education and scare and tribal population of the state are the main factors which hamper the development of girls' education in the State.

7. The State Council for Women's education is doing some useful work in mobilising public opinion for girls Education, yet, it is difficult to expect desired results unless these pro.

grammes are backed by some incentives.

8. There is difficulty in getting women teachers for working in rural areas.

9. The question of women's education in the State has not been dealt with seriously for want of adequate funds.

10. The problem of women's education is so large in magnitude that the present achievement appears almost negligible in comparison to it.

Recommendations :

1. Since mothers are the builders of a nation, education of girls and women should be given top-priority in any development programme.

2. The problem of women's education in the State should be dealt with as a special problem of education. Extra efforts in the form of free education, scholarships, supply of books and stationary free of cost, free school uniform and transport facilities should be made to encourage the education of girls at all stages of education.

3. Adequate funds for the expansion of education of girls at all stages should be made available to the institutions concerned and the Central Government should come forward with arrangement for grants-in-aid to the State Government on a hundred per cent basis.

4. Enrolment of girls at all stages of education should be increased by undertaking special 'Enrolment Drives' for girls. Special efforts should be made to increase this in rural areas. For this purpose the State Government should provide funds for organisation of women's education weeks and assistance to State Council for intensive propoganda.

5. The number of women teachers should be increased in order to bring a greater number of girls into schools.

6. In order that educated women may be encouraged to join the teaching profession, facilities for free quarters, medical aid, increased salary and other benefits be offered to them. Women teachers working in rural areas should be given village allowance.

7. Training Institutions for women teachers should be increased in order to ensure better supply of trained teachers for the girls schools.

8. All the general and special education should be effectively carried out.

9. Adult and social education should be spread among the illiterate men and women of the rural areas, with a view to emphasize the importance of girls' education among them so that they may send their girls to schools.

10. Teachers should be encouraged to increase their academic and professional qualifications. They should also be given impetus to do research work in their own institutions.

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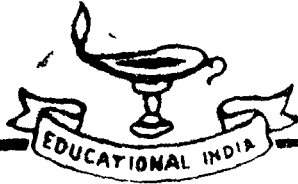
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Need to Evaluate the A. P.'s New Evaluation Scheme

It is common knowledge that the State of Andhra Pradesh was the forerunner in the introduction of new Evaluation Scheme as a measure of Examination Reform. At the time of the introduction of the scheme—they have before them the proposals from best experts and exponents in the domain of examination reform.

It was seen at that time that Examination became an integral part of the Educational Pattern. To all, Education was no more than passing an examination as a crowning glory. Examinations meant till the end of the Secondary Stage—many sleepless nights to millions of youth—whose number was swelling with the passage of time. It was no less disturbing to thousands of teachers whose efficiency was judged by the man in the street as well as authorities by the yard-stick of the percentage of passes. The examination tested only the scholastic attainments of the examinees leaving aside the more important aspects. The University Education Commission declared in 1947: "We are convinced that if we are to suggest one single reform in educational system, it

should be that of examinations." The Secondary Education Commission said "Examinations dictate the curriculum, vitiate sound methods of teaching, encourage the student to concentrate on too narrow a field and thus develop wrong values in Education." The alarming percentage of failures in the examination and the perceptible deterioration of standards of attainment of even the successful products as revealed in their performances in the Public Service Commission examinations have lent a new urgency to the problem of education.

THE University Grants Commission appointed a Committee in 1958 to make a thorough study of the problems involved in the task of examination reform and propose remedial measures. Dr. Benjamin Bloom of the University of Chicago was engaged by the Ministry of Education to direct several workshops on Evaluation in Secondary Education. His services were utilised by the UGC to organise Workshops or Seminars at Osmania, Poona, Patna and Aligarh Universities. His report—revealed how the specific objectives of teaching could be formulated and how test

materials could be prepared to assess the extent to which the objectives have to be fulfilled. Dr. Bloom located the high rate of failure in the examination in i) the selection or admission procedures ii) the types of learning experience provided iii) the types of examination used to determine success or failure. He further said that examination reform is really a complex one involving the whole of the teaching learning process and would be largely solved if we could somehow improve the quality and methods of teaching and the responses and learning habits of students. He also said "Examinations do much to control the behaviour, thoughts and attitudes of students and teachers alike. But no living individual or group has control over the examinations; only a body of traditions and practices which have accumulated over the years. The syllabus usually contains a detailed list of topics and it suggests that education is equated with the acquisition of some detailed information on each of the topics listed. The effect of such a syllabus and the pressure of time and numbers of students makes information on each topic the major purpose of instruction for the teachers, the major objective emphasised by the examiner and the cramming of such information the major task undertaken by the student. A comparison of the question papers over several years reveals a highly stereotyped character in the questions set. Originality in setting questions is not valued.

The necessary material for setting the paper are the syllabus and the old question papers, the same tools as the student uses in his preparation for the examination." The teachers, since their efficiency is judged by the percentage of passes are motivated to dictate notes on the probable questions which can easily be reproduced in the examination hall.

THE drawbacks of the then examination system were listed as follows:

a) More subjectivity in awarding marks and great variation from examiner to examiner.

b) Chance played a more important part to determine the success or failure of a candidate.

c) It did not test the important abilities of the pupils and encouraged cramming.

d) The questions were mostly stereotyped and repetitive.

e) Question Papers were often too easy or too stiff.

f) No weightage was given to internal assessment.

g) The coverage of syllabus was not adequate.

h) Question papers were set by paper-setters who had no experience of teaching higher secondary classes thus ignoring the level of competence of the students.

i) It encouraged selective studies.

j) The time allotted to the chief-examiner was inadequate and the number of answer books

allotted to examiners was sometimes more than they could examine during the time allotted for the purpose which contributed for irrational valuation.

FOR failures - weakness in the school administration i. e. ineffective guidance, supervision and administration of schools had been unanimously rated as contributing to the incidence of failure. It was also noted that good teachers, professionally well qualified, were not available in large numbers.

A GAINST this historical background the State of Andhra Pradesh plunged into the examination reform as suggested by the Experts and introduced the non-detention system. During the period from 1970 to August 1973 the State was in a great turmoil and witnessed two agitations unparalleled in history and virtually the follow-up measures of the nondetention system could not be thought of until August 1973 though the educational setup at the top already devised a programme. The PEACE had been completely restored by September 1973 and as a measure of orientation to all the Inspecting Staff, 3 State Level Conferences were held in the 3 regions of the State. The last of the series was held on Sept. 5, 1973.

THUS the Andhra measure of Examination reform has been started in right earnest from September 5, 1973—and it is more than 3 years by now. Effectiveness

is often the most difficult criterion to employ because of the time lag between a particular demonstration and the response. Whether or not a student develops an adequate set of skills may take as long as 2 years to assess. Now that it is more than 2 years—it is better the A. P. reform be evaluated scientifically either by the NCERT or SCERT or by some expert body and the country made known the tangible results the A. P. Govt. achieved—so that other States may emulate its example with or without modifications. It will be worthwhile for A. P. also to know where it stands—whether the scheme is working on right lines and yielding the desired results or whether drastic modifications are required or as to what course to be adopted.

IT is worthwhile remembering the salient points of the A. P.'s New Evaluation Scheme. As the dread of examinations has completely dominated—the non-detention system has been ushered in. The fear of detention sometimes acts as a powerful factor damping the enthusiasm of the pupils preparing for the examination. To avoid this deterrant factor, Evaluation procedures are devised to assess the achievement of pupils. This attempt they said is made in an atmosphere free from fear of detention by merely grading the Students' progress without indicating pass or failure. Thus the stigma of failure is taken away and with it the fear of detention.

ALL those concerned were given orientation on New Evaluation Policy and procedure as a followup of the non-detention policy with stress on objective-based teaching techniques. These were dealt with in the broad spectrum of Evaluation. All round development of the pupils and their growth was asked to be carefully assessed stressing from the very beginning and continuously measuring throughout the year and various recording instruments were devised for effective evaluation. The 'Annual Plans', 'Unit Plans' and 'Lesson Plans' are suggested to improve instructional activities with 'Unit Tests', 'Standardised Tests' and 'Assignments' to strengthen the assessment programme. Cumulative School records also are asked to be maintained for recording the all round development of the child while progress cards are taken up to indicate the scholastic attainments of the children.

EMPHASIS is asked to be given on the 'design and preparation' of individual test items to measure in the 3 domains of human life—Cognitive, Psycho-Motor and Affective domains. In the Cognitive domain attempts are made for comprehensiveness in the child's understanding, judgement, ability to remember to assess his capabilities in knowledge, comprehension, application, analysis and judgement. The child's skills are asked to be measured in the 'Psycho-Motor domain—skills in such things as in Music, Tyloring, Type-Writing,

Reading a Map etc. to focus how his thinking faculties function through neuro-muscular coordination. In the 'Affective domain' his capabilities as well as attitudes in appreciating things are asked to be assessed and developed.

THE Headmasters have been asked to utilise their Institutional plans and all other ancillary services such as School Complex, Scouting, Science Club etc.—to strengthen the endeavour of the teachers in implementing the new evaluation procedures. In the Institutional Planning they are asked to work out the Minimum Academic Programme and the School Improvement Programme'. They are asked to work out improvements with resources available and with those resources they can improvise locally. The Schools also are asked to have some 'in-service Programmes' so that all teachers are effectively re-oriented to the new ideas in Education and equip themselves with the necessary dynamism. School Complex has been stressed so that the Primary and Upper Schools can have access to facilities available in Secondary Schools—and also bridge gaps in the attainment of pupils expected of them in higher standards.

THIS ambitious programme has been started in A. P. some 3 years ago. We have outlined herein the back-ground and the new setting. It is high time that the A. P. Government or NCERT should make a system analysis and then move further in the programme.

WE feel it appropriate to apprise the Government of how the Community feels about the new programme.

i) Take it easy attitude is growing among children which will spoil the generations to come.

ii) The community shares with Dewey a faith in the healthy capabilities of children and with Rousseau a belief that every thing is good as it comes from the hands of the creator; every thing degenerates in the hands of man. It may be true what John Holt said 'Nobody is born stupid but we encourage children to act stupidly.'

iii) Contemporary society and the educational system are hostile to the process of learning and maturation.

iv) What we have now* is compulsory mis-education.

v) Chance still plays a more important part to determine the success or failure of a candidate—but that it is postponed till Class VII Examination and S. S. C. Examination; in the intervening classes promoting pupils with very little or no learning at all.

vi) The only two public Examinations do not test the important abilities of the pupils.

vii) No weightage is given to internal assessment even in this new evaluation scheme in the only two public examinations one at Class VII and the other at Class X;

viii) Even the new scheme is encouraging selective studies.

ix) The time allotted to examiners is still inadequate and the craze for valuing more answer scripts to earn a few paise more still looms large.

x) The weakness of the school administration still persists in guidance, supervision and administration.

xi) The Teachers are still judged of their efficiency only by the percentage of passes—and the threat to the teachers is now all the more greater today than it was before — with stoppage of increments in their salaries.

xii) The alarming percentage of failures in the Public Examinations even in the new system is an eye-opener to the fact that the new system is no better than the previous one.

THE new evaluation scheme has been claimed to be an educational innovation. Many are afraid that the expected changes failed to materialise and the failure is attributed to some circumstances also which are as under:

i) Department's failure to anticipate problems which teachers encountered and the lack of feedback mechanism which made it impossible to deal with problems as they arose.

ii) Failure to modify the established practices.

iii) The teachers' inability to carry out their new rolls due to lack of understanding and inadequately developed skills.

iv) Instructional procedures and materials lacked specificity and were often unavailable.

v) A deep frustration on the part of the teachers as they became aware of their inability to handle the situation in the prescribed manner.

vi) Too much work-load with too many working hours.

vii) Although the ultimate criterion for a successful change strategy is the performance of the students—shortrun criteria are needed as a means for guiding the change process to ensure that continuous progress is made.

viii) The necessary dynamism and the follow-up of the follow-up work is not there with the change of men and authority who conceived of the new evaluation scheme.

ix) Promotions and the performance of the students should not have been separated.

ANDHRA Pradesh seems to be where it was previously and the alarming percentage of failures at both the Public Examinations and even at the Intermediate level pin point the above deduction. 8 years wasteful spending and crippling results is no small phenomena to be brushed aside.

WE urge the A.P. Government's immediate attention for a proper System (Analysis of its (new) evaluation scheme with no further loss of time and precious years for the students.

M. V. S.

language would be the second language in Hindi States. He said these discrepancies would be removed in the subsequent editions of council's document.

PUBLIC OPINION

N. C. E. R. T. DIRECTOR

Clarifies

Study of English

Prof. Raiz Ahmed, Director of the National Council of Educational Research and Training said that in the curriculum for the 10 year school course prepared by the NCERT, the three-language formula had been adhered to, under which the first language would be the mother-tongue the second language would be Hindi for those whose mother tongue was not Hindi, and the third language would be English. He reiterated that the NCERT document envisaged no departure from this.

As regards the study of these languages, Prof. Ahmed said the document clearly stated that the study of the first language (mother tongue) should start from the first class, the second language might be introduced in the primary stage or middle stage and the third language in class six. It was clear from this that study of English (the third language) would begin in the sixth class in both Hindi and non-Hindi States and therefore there was no reason to fear that students in non-Hindi States would be placed at a disadvantage compared to those in Hindi States in the matter of study of English. In fact, he felt very strongly that the learning of English had to be strengthened.

Prof. Ahmed conceded there were some discrepancies in the document which had given rise to the apprehensions. For instance, the scheme of studies said that the second language could be introduced in class six and the third language (English) could be added in class nine. In earlier paragraphs however the document had said that the second language might be introduced in the primary stage or middle stage, and the third language in class six. The scheme also made it appear that English would be the second language for those whose mother tongue was Hindi.

This, he said, did not reflect the correct position as under the accepted three-language formula, a modern Indian



THE TECHNOLOGY OF TOMORROW

By VLADISLAV VOLOGDIN

(*Director of the All-Union Research and Design Institute of High-Frequency Currents.*)

The contribution of high-frequency technology to scientific and technological progress perhaps exceeds the "credit" opened to it by other branches because this is not only the technology of today, but also of tomorrow.

High-frequency installations change the factory shops and the very process of labour. Here are some examples. Surface induction hardening installations are the most traditional lines of our research and one of the mass types of electrical engineering products. At present, more than 200 types of such fully or partly automated installations operate at Soviet enterprises. These are compact installations producing no fire, smoke or harmful vapours. They have led to truly cosmic speeds and to the utmost accuracy — the depth of a hundred layer varies within tenth of a millimetre and the cycle of finishing the parts of machinery has been reduced hundreds of times.

The Institute has designed equipment for high-frequency welding of pipes. As a result of the introduction of this method, the speed of welding and hence the rolling of pipes has increased three to four times and has reached now 120 metres per minute. This method has enabled to adequately weld large-diameter pipes needed for giant gas pipelines.

High-frequency welding has revolutionised the technology of the manufacture of cable. We do not use now lead coatings for long-distance cables because such coatings are heavy and costly. We

employ light and cheap welded jackets from aluminium and steel.

New Method

Semiconductor power technology employed in DC power transmission

Moscow is preparing for the World Electrical Engineering Congress which is scheduled for June 1977 and will coincide with the opening of the International Electro-77 Exhibition. The following article is based on an APN interview with the author in this connection.

lines, Metro power supplies, in electrically-driven transport and in electrolysis is based on a large-diameter monocrystal silicon. Until recently, the obtaining of such silicon involved great difficulties. At our Institute, a fundamentally new method was suggested — crucibleless zone melting in a high-frequency electromagnetic field. On the basis of this method, a series of Kristall (Crystal) installations has been set up in which superpure monocrystalline silicon is melted, crystals being up to 80 mm in diameter.

Not only metals, but also dielectrics can be processed by high-frequency currents, monolithic heat insulation from expandable polystyrene has been obtained. In the near future, this method will be introduced at factories producing household refrigerators. It is common knowledge that the problem of economising electrical energy has assumed great acuteness all over the world. Refrigerators with the above insulation

reduce the expenditure of electricity of 30 to 40 per cent.

High-frequency plasma is practically unpolluted and therefore is used for obtaining super-pure materials with the needed structure. The most exotic compounds can be derived this way. If we direct a plasma jet on the surface of the construction panel, concrete will become foamy and glassy, and drab grey surface will look like a frozen sea tide. Soon the accuracy of this comparison will be checked at the Leningrad house-building factory where the first installation for decorative finishing of construction panels will be put into operation.

New Innovation

Artificial crystals with unusual properties — phianites — have been obtained with the aid of high-frequency currents. They have been first produced at the Physics Institute of the USSR Academy of Sciences (PHIAN). Hence their name. At our Institute, an installation for the commercial production of these precious stones of the 20th century has been designed. Not only scientists and engineers, but also jewellers show interest in phianites. The index of refraction of light rays in phianites is close to that in diamonds, the gamut of colours and shades is practically unbounded and the method

of their production is rather simple. That is why phianites are cheaper than other artificial precious stones.

High-frequency technology enables introducing new technological processes and new materials with unparalleled properties. They will introduce speed and quality. Our Institute is designing high-frequency ranges. It will take such an electric range not more than five minutes to cook any meal. Due to specific features of heating, vitamins in food are not destroyed and it is possible to cook in the same utensil in which the meal will be got to the table. This method will help solve the problem of rapid and adequate cooking at public catering establishments. Such ranges will be also of use in household kitchens. The first batch of miraculous ranges will soon be turned out by the Leningrad factory of high-frequency installations.

Being applied in the national economy, high-frequency technology produces a very considerable economic effect. Even now some of our installations pay off in a few months. In the past five-year period, the economic effect of introducing new highfrequency technology was estimated at 129 million roubles, and under the 10th Five-Year Plan (1976-1980) this figure will be brought to 200 million roubles. (APN)

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by **I. Satya Sundaram,**

Lecturer, 10/156, Balaramunipet, MACHILIPATNAM (A. P.) 521 001

SIR FRANCIS GALTON — HEREDITARY GENIUS

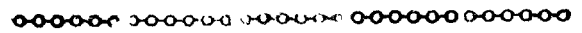
By TERENCE MCLAUGHLIN

Two cousins born in the centre of England in the early part of the nineteenth century, within 13 years and 40 miles of one another, were both to become distinguished scientists in their own time. One, Charles Darwin has become famous for his theory of evolution; the other, Francis Galton, is remembered only by groups of specialists

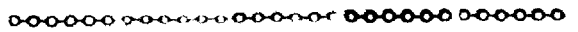
Yet the number and diversity of these groups of specialists is a measure of the very rare quality of the man. There can be very few other scientists of the period whose work is still quoted and used by statisticians, psychologists, anthropologists, sociologists, explorers, mountain-climbers, weather-forecasters and detectives, but it is quite true of Galton. In the field of psychology alone, which Galton would not have considered his main subject, the modern writer Dr Boris Semeonoff of Edinburgh University has said, 'The breadth of Galton's interest, and the range of information he had at his disposal are indeed astonishing, as is the number of key concepts in present-day psychology that owe their origin to Galton. Similar tributes may be found in the writings of experts in other fields that Galton enriched; indeed, it often seems that the main reason for the present neglect of Galton is that no modern scientist has the breadth of information to understand everything that he wrote.'

Born in Birmingham in 1822, Galton came from a Quaker family who approved of education but not of the atmosphere of the British schools and universities of the time, so his training was intermittent and irregular. However, what he did learn was probably more useful to a future scientist than the Greek and Latin that formed so large a part of the curriculum of nineteenth-century English schools. He studied medicine and pharmacy and travelled a good deal, so by the time he decided for himself that he wanted a university education he was already familiar with the

mental hospitals of Vienna and had narrowly escaped the plague in Smyrna. His fellow students at Trinity College, Cambridge, found him an odd companion.



From exploring in Africa to forecasting weather and from indexing fingerprints to studying mental imagery, the scope of Sir Francis Galton's work was indeed remarkable. With his breadth of detailed knowledge he made contributions to science that are today recognized as important by specialists in many fields.



Africa

Even at Cambridge he hankered for more adventure. In 1845 he travelled to Egypt, Syria and the Sudan, and went down the Nile to Khartoum—a very different city from the present one—spending long days on camel-back in the company of slave-traders and similar companions. At that time he resolved to explore some of the 'blank spaces' on the map of Africa, and in 1850 set out to map completely unknown regions of South-West Africa, travelling about 2000 miles in Damaraland and Ovamboland. Conditions were hard, and only his ingenuity and scientific training enabled him to survive. A vivid picture of his life there appears from odd details in his record of the exploration—on drought conditions, for example, 'An umbrella, reversed, will catch water; but the first drippings from clothes that have been long unwashed, as from a mackintosh cloak, is intolerably nauseous and very unwholesome...' or the comforting information that the spring of a lion can be avoided—'It is not rapid at all; it is a slow movement... No wild animal can leap ten yards, and they all make a high trajectory in their leaps...'

When he returned home from Africa Galton was unsettled. He had contracted malaria (which remained as a recu-

rent illness until he was in his eighties) so it was unwise for him to undertake more exploration. As Secretary of the Royal Geographical Society he gave a great deal of help to other explorers such as Speke, who discovered the source of the Nile, but he needed some other occupation and found it in the study of the weather.

Charting the Weather

Le Verrier, the French astronomer, had already pointed out the connection between bad weather and centres of low pressure but no one had collected any large-scale data for a general theory of weather. Galton took on the laborious task of obtaining pressure, temperature and rainfall readings from ships, ports, military stations and anywhere where people could be found to take the measurements. His first 'Synchronous Weather Chart' was produced for the 16th of January 1861, and it is interesting that the symbols he used for approaching fronts and so on are very similar to those used today. While compiling his maps, he observed that fine weather was associated with centres of high pressure and coined the name 'anticyclone' for this phenomenon. By 1871 he was able to supply regular weather maps for shipowners and produced the first public weather chart in *The Times*, London, for April 1st 1875. Galton actually produced some weather forecasts, in the sense of predicting the probable conditions: they would have been of use to the slowmoving ships of the time if only there had been some way of getting the information to them. Telegraphs served the ports of call, but the ships were entirely cut off.

Galton set out the theory of weather forecasting in his book *Meteorographia* (1869), but a new interest had already possessed him that was to occupy him for the rest of his life. In 1859 his cousin Darwin had published *The Origin of Species* recounting in vast detail the effects of natural selection and heredity on animals. Galton became fascinated by the thought that similar processes must be going on among human beings, if only they could be detected and measured

and in *Hereditary Genius* (1869) he produced the first of a series of books on the 'survival of the fittest' in the human race. The phrase seems suspect today, because of its misuse by various racist groups, but Galton's studies of selection led him to conclusions that were far more humanitarian than the general climate of his time. He pointed out, for example, that the unhealthy, crowded Victorian towns had a degrading effect on the whole population, because the more enterprising country boys left the land to try to make their fortunes in the cities and many of them died young because of the conditions. In this way some of Britain's fittest sons were drained away.

Realizing that fitness in a human being may be intelligence, or strength, or dexterity or a number of other qualities, Galton set himself to measure as many qualities as he could. The fact that this had never been done before, and that the instruments to do it did not exist, never worried him. If he wanted to measure something, he invented the apparatus to measure it and often made the equipment with his own hands. So when he wanted to test the sharpness of hearing in people and animals, he invented an ultrasonic instrument still called the Galton whistle. He discovered the now well-known fact that our sensitivity to very high notes decreases as we get older, and that many animals can hear notes that are ultrasonic to humans. Galton connected his whistle to a rubber tube and bulb and disguised this as a walking stick, so that he could walk round the London Zoo checking which notes attracted various animals' attention.

Fingerprint Index

While considering human characteristics that might be hereditary, his attention was drawn to the unchanging quality of fingerprints throughout life. Sir William Herschel had used fingerprints for identification in India, mainly for the authentication of signatures, but Galton realized that they could be used for the detection of criminals. At the request of

Scotland Yard he spent about eight years in the study of fingerprints and devised the standard method of indexing them by 'arches, loops, and whorls'. The French criminologist Bertillon is often credited with the invention of the fingerprint detection system, but Galton produced his work first. He introduced the essential system to enable a detective to index a print and, more important, find it in the records again.

He had a passion for counting. He said himself that when walking the streets of a town he found it impossible not to produce statistics of the numbers of tall and short people, or the proportion of pretty and ugly girls. When delivering lectures he mentally assessed the number of fidgets in the audience, believing that people fidgeted more when they were bored. He invented an important tool of statistical mathematics, the correlational calculus, to help him with his endless tables of measurements, and said, 'Until the phenomena of any branch of

knowledge have been submitted to measurement and number it cannot assume the status and dignity of a science.

Yet he was not an inhuman calculating machine. His book *Inquiries into Human Faculty* (1883), which sums up much of the work of his later life, shows him as a man of humour and resource, constantly delighting in the variability of human personality and open-minded to any new concept. From considerations of mental imagery he conceived the idea of the unconscious mind several years before Freud, and his work on the various ways that people visualize thought is only now becoming important to psychologists who want to find out how best to present ideas in education.

In fact, as with the drought and lions in Africa, he faced recalcitrant scientific facts and problems with the same blend of logic and common sense, a great example of his own phrase 'hereditary genius'.

— By Courtesy of "Spectrum" No. 142 / 1976.

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