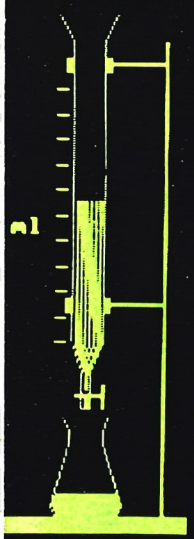
```
(DM-LIST (L) (COND ((NULL (CDR L
                (T (CONS 'CONS
                    (CONS
                (CONS (CONS (CAR L)
                    (CDDR L
            NIL ))))))
```

```
010 for i = 1 to 15
020       if ( a[i] = name$ ) goto 100
030       next i
040 found = 0
050 return
060 rem  *** The Element is Found
070 found = i
080 return
```

रचनाक्रम / रचन संख्या

बीजक के विभिन्न पर्वों में रचनाक्रम और रचन संख्या सम्बन्धी समस्याएं है । पर सभी पर्वों में रासी रचनाओं की संख्या 84 है



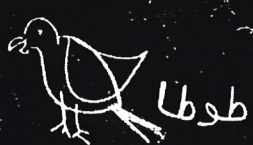
Flow control
F : 1 ml
M : 0.2 ml
S : 0.1 ml
@ : stir
T : finish

Flask:CH_3COOH
+ 2 drops of
phenolphthalein

WORKSHOP

NATIONAL ISSU

COMPUTERS IN EDUCATION



ایک پھول

گلاب، گھوڑا، جنگل

कमल बघ

हसन गवत आण

International Organising Committee

Prof. B. Nag	Chairman
Dr. L. Chan	
Mr. P. Bollerslev	Member
Prof. T. Nishimura	Member
Dr. B. Barta	Member
Dr. C. Boswell	Member

Local Organising Committee

Prof. B. Nag	Chairman
Prof. P. C. P. Bhatt	Member
Prof P. V. S. Rao	Member
Prof. J. R. Isaac	Member
Mr. H. Sonawala	Member
Col. M. P. Rao	Member
Dr. Nirmal Jain	Member
Ms. L. Saldanha	Member
Maj. Genl. A. Balasubramanian	Member
Prof. S. S. S. P. Rao	Member Secretary

The City of Bombay

Bombay is essentially an island on the coast of India. The temperature variatio expected in March would be between 28° C. It could be slightly humid, but unpleasantly so. Light summer clothing suffice.

This city is not only one of the biggest commercial and industrial complexes in country, but is also the heart of the co industry. There are numerous large cor companies such as Tata Consulting Se Tata Burroughs limited, International C Indian Manufacture Limited, Hinditron Datamatics Consultancy Services, Com Maintenance Corporation, and a host o The Santacruz Electronics Export Prom (SEEPZ) to the North of Bombay has computer-related export activity. Besid is the home of several prestigious scie organizations such as the Bhabha Ato Research Centre (BARC), the Tata Ins Fundamental Research (TIFR), the Na Centre for Software Technology (NCS NCSDCT) and other large research org

With a population exceeding 8 million, also a cultural centre with well establis music and theatre groups.

Hotels in Bombay

Name of Hotel	Approximate Per Day in R Single Room
Down town	
Taj Mahal Hotel	1100
Hotel Oberoi Towers (Old)	1100
Near Campus of IIT-Bombay	
Holiday Inn	800
Centaur (Airport)	700
Centaur Juhu Beach Hotel	600
Kumaria Presidency	400
Hotel Avion	300
Tunga International	250

1 US dollar is 12.50 Indian Rupees approx

Future TC-3 (Education) Activities

The Technical Committee 3 of the International Federation of Information Processing is mainly concerned with the educational aspects as is reflected in their present and future planned activities :-

- "Information and the Teaching of Mathematics in Developing Countries" 1986, Tunisia
- "The Computer in the Home-Its Challenge to Education" 1986, Switzerland
- "Changing Requirements for Training and Education in Informatics" (proposed)
- "Microcomputers in Secondary Education", 1986, Japan
- "Micros Plus", 1986, Australia
- "Mass Education and Informatics" 1986, Hungary
- "A Computer for each Student and its Impact on Teaching and the Curriculum in the University" 1987; Netherlands
- "Artificial Intelligence Tools in Education", 1987, Italy
- "Informatics and the Teaching of Mathematics", 1987, Bulgaria NB : The conference is scheduled to precede the UNESCO conference on "Children in the Information Age"
- "African Regional Conference on Computers and Education" (proposed)
- "Teacher Training Evaluation and Research", Belgium, 1987

Computers and Education in the Developing World

While the potential of computer technology has been fairly well exploited in the developed world, it has hardly been tapped in the developing world. This is mainly because these countries have been heavily burdened with problems caused by over-population, aggravated by dire resource shortages. However, it has now been realized that it is only through education that large masses of people can be converted from being a national liability into effective and productive assets to the nation. It is in this gigantic task that the computer can be called upon to play an immensely effective role with its potential capability to offer educational inputs at all levels. Education must necessarily be tempered by traditional and cultural values, and numerous other regional parameters (not to mention languages and dialects!).

A Case Study : India

As the Workshop will be held in India, it be appropriate to highlight some relevant Here is an example of a country in the d world, which on the one hand seems to made tremendous progress in science an technology (among countries of the wor is ranked as having the third largest scie manpower and as the tenth largest indus force) but on the other hand is confronte almost insurmountable problems - mainly by over-population. Educational efforts, essentially based on Western models, do seem to be bringing in the expected rich dividends. Seized with this problem, the Government has launched a drive to co-ordinate and strengthen all activities the development of human resources. It recent years that a Ministry of Human R Development has been set-up to directly these issues.

A major task confronting this Ministry, with its operational wing of the Department of Education, was to study t educational system with a view towards it more effective towards meeting the cu imperatives. A major document called "O of Education-A Policy Perspective" was to serve as a working paper for a nationa on educational reforms. Based on these a new educational policy has been drafte implementation aspects have been taken in this context that a Workshop of this n could play a significant role. Most neigh countries more or less share the problem confronting India, and are also deeply co with educational reforms.

Naturally, the role to be played by techn this gigantic task must be given prime importance. Some fairly large scale proje been carried out in this context. The first SITE (Satellite Instructional Television Experiment) project which attempted to the communications potential of satellite bringing educational (and entertainment) programmes to over two thousand remot villages, using very low-cost 'chicken-m antennae. This experiment was operation year and yielded rich insights into unders the problems of 'software' development, the very unexpected reactions and perce villagers. Two years ago a pilot project

launched to introduce computers in a few hundred schools all over the country. Under this CLASS (Computer Literacy and Awareness in School Studies) project, initially 250 schools were given two BBC computers each, together with adequate educational software support. This project did generate considerable interest, and also triggered off the development of educational courseware in the country. There also have been efforts in the use of Hindi and other local languages. Yet another scheme is the national TV-based "Country-Wide Classroom" daily one-hour educational programme, which uses local and foreign produced educational programmes at college level. A major problem of these educational methods has been the inability to meaningfully integrate them with the current conventional education efforts.

Obviously all developing countries must necessarily explore all educational technologies that could possibly help in their national programmes of vocational training, distance education, non-formal education, adult education and numerous other areas.

The UNESCO

The statement on the UN conclusions v
abstracted from a UN report produced a
early as 1971. There have been continu
efforts in this direction periodically, yet
remains to be done in exploiting the po
computers in development. The UNESC
planning a congress in 1988 on "Inform
Education". The objective is to give UN
inputs for the next 6-year plan (1990-1
The UNESCO has the following broad c
in the area of Informatics in Education :

- o Enhancement of national capacities
- o Trainers
- o Formulate national policy
- o Use of computers for teaching mathematic
- o Use of computers for teaching mathematic
- o Training of teaching personnel for the use
  (What is the impact of computers on curric
  teacher training?)
- o Use of computers for the handicapped
  (democratisation of education)
- o Studies converging on the '88 congress
- o How can one reorganise university educati
  when using communication facilities
- o What can computers do in distance educat
- o Computers in technical/vocational levels
- o Data exchange on current projects

The proposed Workshop could serve as
effective forerunner to the UNESCO eff
special importance being given to comp
in mass human resource developmental

National Issues on Computers in Education

Computers in Development

Several international forums have focussed attention on the vital role that computers could play in the developmental process. However, despite the numerous resolutions and recommendations, the potential of computers in development has yet to be tapped in most countries of the developing world. It is only in recent years that the importance of human resource development has been recognized as a key factor in this effort. It is in this context that the crucial role that could be played by computers in the educational process be clearly identified.

The United Nations Recommendations

At its 23rd session, the General Assembly of the UN adopted a resolution 2458 (XXIII) requesting the Secretary-General to prepare a report giving special consideration to the situation in developing countries with regard to :

a) The use of computers in accelerating the process of economic and social development
b) International action to intensify cooperation in the field of computers, and
c) The role to be played by the UN in promoting international cooperation in computers, especially on questions concerning the transfer of technology, the training of personnel and technical equipment.

The principal conclusions of this effort, supported by numerous specific recommendations were :

Conclusion 1 :

Education and training for the application of computers to accelerate the process of economic and social development must receive first priority.

Conclusion 2 :

Each developing country needs a broad national policy, consistent with its national goals, on the application of computer technology.

Conclusion 3 :

International co-operation needs to be increased in activities relating to the application of computer technology to development.

Conclusion 4 :

Computer technology will increase in importance in the developing countries during the Second United Nations Development Decade and its diffusion and sound application can make a significant contribution in accelerating the rate of their economic and social development.

Theme of the Workshop

The theme of the Workshop would be t
in depth the various aspects in which t
of computers and educational technolo
be harnessed towards overcoming or mi
the educational problems of the develop

Major National Educational Issues

The Workshop will bring into focus maj
of national interest in the following area
particular reference to the role played b
computers :-

- Computer Science Education
- Secondary and University Education
- Rural Education
- Vocational Training
- Distance Education
- Multi-language Instructional Systems
- Education for the Handicapped
- Adult Education
- Non-formal Education

Workshop Participants

i. Foreign Participation :
All members of the TC-3 (IFIP) wi
coming to Bombay for the next me
held at the Indian Institute of Techn
Bombay. Hence, the Workshop wil
benefit from their knowledge and e

ii. Invited Delegates
from neighbouring countries :
As the Workshop would be of grea
all countries in the developing wor
delegates will be invited from these

iii. Indian Participation :
Delegates from India will be select
those concerned with the planning
implementation of the new educati
policies. They will include particip
government and private organizatio
concerned with education and com

Call to Participants

All participants are requested to, not only prepare themselves for the Workshop sessions, but also to :

1. Prepare short papers on selected topics for presentation, and if possible, distribution to all participants.
2. Participants are also urged to send in any specific suggestions which could assist in making the Workshop more meaningful. Special papers, references, brochures, etc. would be most welcome.

Workshop Report

The deliberations of the Workshop will be summarized in the form of specific conclusions and recommendations, for circulation to various concerned agencies.

Venue of the Workshop

The Indian Institute of Technology, Bombay, (IIT–B) is one of the five Institutes of higher technological studies set-up by the Government of India, with some initial support from the UNESCO. The Institute is fortunate to be situated to the north of the city of Bombay, which is India's second largest city, and one of the most important commercial and industrial centres of the country. This is a residential campus with 2500 students at all levels (B. Tech., M. Sc., M. Tech and Ph. D. degrees), and over 350 academic staff from various engineering, science and humanities disciplines. All departments are involved in sponsored and consultancy projects, in addition to their academic and research activities.

Workshop : National Issues on Computers in Educatio

Venue :

Indian Institute of Technology,
Powai, Bombay 400 076
India.

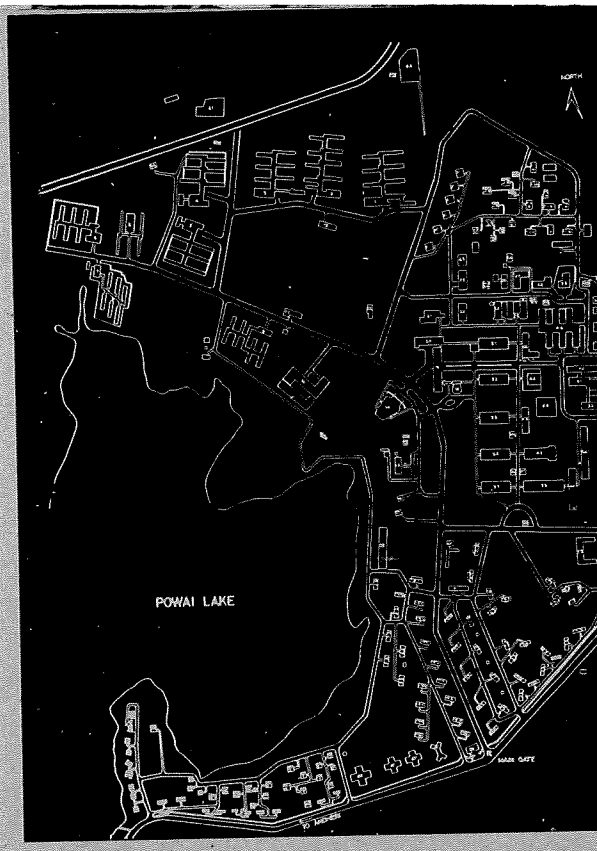
DATES :

MARCH 16-19, 1987

Organizers :

Technical Committee-3, International Federation for Information Processing (TC-3, IFIP)
Computer Society of India
Indian Institute of Technology, Bombay

Prof. B. Nag
Chairman, Organising Committee,
Director
Indian Institute of Technology
Bombay, 400 076, India



The Institute is fully residential. Faculty members membering 320, and 2300 students, both undergraduates and postgraduates, reside on the campus. Some Supporting staff is also provided with residential accommodation on the campus. This has made the Institute into a small township with students, faculty, staff and their families residing on the campus. All kinds of residential facilities needed have been provided. There is a all equipped hospital on the campus and there are Higher Secondary and Primary Campus Schools. Shopping Centre and recreational facilities are also available.

The student Gymkhana provides opportunities for extracurricular activities and for indoor and outdoor games. A Boat Club is in existance and a Swmming Pool will be ready soon. The Institute makes all attempts to see that students develop an allround personally for their successful future career.

The Institute, during the course of its existence, produced graduates and postgraduates who have very well received both in this country and abroa of them now occupy high positions and have be leaders in their chosen profession. A get-togethe distinguished Alumni of the Institute has been re arranged, in order to have some feedback from improvements in Institute's programmes.

The reputation of the Institute has now spread a the privilege of attracting a large number of dis visitors from both within the country and abroad. visitors are leaders in the field of Engineering, Sc Technology and other fields. The Institute is als position to organise on the campus conferences symposia of both National and International categ new Guest House of the Institute has become a help for these activities as it can accommodate t and conference participants in a very comfortable on the Campus. The faculty of the Institute als invited by institutions in India and abroad. A go of faculty members travel abroad each year to present papers at International Conferences held other countires.

Indian Institute of Technology Bombay

1958-1978


ILVER JUBILEE-IIT BOMB
1958 - 1982
इंडियन इन्स्टीट्यूट ऑफ टेक्नालॉजी
बम्बई
का शिलान्यास
प्रधानमंत्री श्री जवाहरलाल नेहरू ने
10 मार्च १९५८ को किया
INDIAN INSTITUTE OF TECHNOLOGY
BOMBAY
RONMENT DAY CELEBRATION
ON AIR AND WATER POLLUTION
JUNE 6 AND 7, 1979
L SCIENCE AND ENGINEERIN
N INST E OF TECHNOLOGY BOM
NATIONAL
SOLAR ENERGY
CONVENTION
1979
DECEMBER 13.14.15
ORGANISED BY
INDIAN INSTITUTE OF TECHNOLOGY
BOMBAY
Design for Development
Chairman

The Indian Institute of Technology, Bombay, is entering its 25th year in March 1982. Since its inception in 1958 the Institute has developed into a full-fledged technological Institute of international repute. It is with pride that the Institute wishes to celebrate, its Silver Jubilee Year during 1982-83. At this juncture, the Institute makes a retrospective evaluation of its role played in the sphere of technical education and national programmes of development, and looks forward towards making more significant contributions with renewed vigour and confidence.

The Institute

Based on the recommendations of the Sarkar Committee's report to set up institutes of advanced learning in the country, the first of the higher Institutes of Technology was established in 1951 at Kharagpur.

IIT Bombay was established in 1958 with the cooperation and participation of the UNESCO utilizing the contributions of the Government of the USSR towards building up one of the centres of higher technological education in India. These Centres were designed to serve as ideal teaching and research Institutes for preparing students of high calibre to tackle the challenging problems of the Country.

The Institute received substantial assistance in the form of equipment and expert services - to the tune of 13.9 million roubles - from the USSR through the UNESCO from 1956 to 1973. The Institute received 59 experts and 14 technicians from the various institutions in the USSR. The UNESCO had also offered 27 fellowships for the training of Institute faculty members in the USSR. By now over 40 faculty members of the Institute have had advanced training in USSR.

The Institute has highly qualified faculty, many of whom have obtained their Ph. D. degrees, and advanced training from reputed institutions not only in India, but also in USA, UK, Germany, France, USSR, etc.

The Institute made a beginning with 100 students for the B. Tech degree in July 1958 in temporary premises of the Silk and Art Silk Mills Research Association Building, Worli, Bombay. Later two postgraduate programmes were also introduced in October 1958. The activities of the Institute were shifted to its present permanent location at Powai in July 1959. The same year witnessed the laying of the Foundation stone of the Institute on March 10, 1959 by the late Prime Minister, Pandit Jawaharlal Nehru. The Institute has been steadily growing since then and it has now a selfcontained, fully residential campus.

Institute at a Glance

Campus Area 220 hectares

Student population

B. Tech.	-	1403
M. Sc.	-	108
M. Tech/M.Des/DIIT	-	503
Ph.D.	-	578
Faculty strength	-	328

Departments

Aeronautical Engg.
Chemical Engg.
Chemistry
Civil Engg.
Electrical Engineering
Metallurgical Engg.
Humanities and Social Sciences
Mathematics
Mechanical Engg.
Physics

Centres

Computer Centre
Centre of Studies in Resources Engg.
Industrial Design Centre
Regional Sophisticated Instrumentation Centre
Advanced Centre for Research in Electronics

Sub-Centres

Cryogenic Engineering
Energy Systems
Environmental Science and Engg.
Laser and Laser Systems
Materials Science
Offshore Engg.

Central Service Facilities

Central Library
Workshops
Training and Placement Office
Central Repair Organisation
Glass Blowing Section
Central Photographic Section

General Amenities

Children's Park
Community Hall
Gymkhana
Hospital
Post Office
Convocation Hall
Guest House
Kendriya Vidyalaya
K. G. School
Campus School
Nursery
Swimming Pool
Bank

Degrees awarded upto 1980

B. Tech.	-	4779
M. Sc.	-	648
M. Tech.	-	2631
Ph. D.	-	554
DIIT	-	422

Educational programmes

The Institute offers the following academic programmes in various branches of engineering, science and humanities & social sciences :

B. Tech. Programme

Aeronautical Engg.
Chemical Engg.
Civil Engg.
Electrical Engg.
Mechanical Engg.
Metallurgical Engg.
Computer Science

M. Sc. Programme

Applied geology
Chemistry
Mathematics
Physics

DIIT Programme

Applied Hydrology
Aerial Photo Interpretation
Dock & Harbour Engg.

M. Tech. Programme

Aeronautical Engg,
Chemical Engg.
Civil Engg.
Electrical Engg.
Mechanical Engg.
Metallurgical Engg.

Interdisciplinary M. Tech. Programme

Computer Science
Corrosion Science & Engg.
Environmental Science & Engg.
Energy Systems Engg.
Industrial Engg. & Operations Research
Industrial Management
Systems & Control Engg.
Materials Science

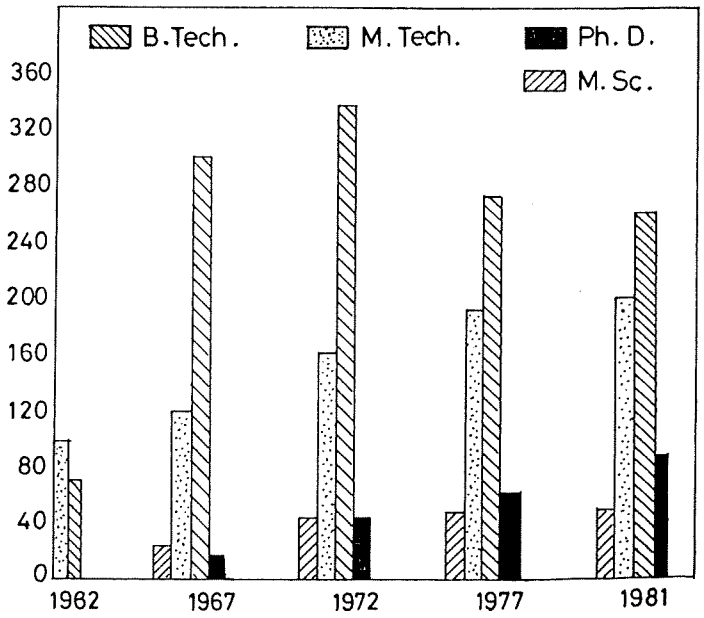
M. DES Programme

Industrial Design

Ph. D. Programme

Aeronautical Engg.
Chemical Engg.
Civil Engg.
Electrical Engg.
Mechanical Engg.
Metallurgical Engg.
Computer Science
Environmental Science & Engg.
Energy Systems Engg.
Industrial Engg. & Operations Research
Materials Science
Systems and Control Engg.
Chemistry
Mathematics
Physics
Humanities & Social Sciences

The Institute is proposing to offer from July 1982 an M. Phil Programme in Humanities and Social Sciences with specialisation in Planning and Development and a B. Tech. Programme in Engineering Physics.



GRADUATES AND POST-GRADUATES PRODUCED DURING 1962 – 1981

Continuing Education for University Teachers

IIT Bombay has been deeply involved in the Quality Improvement Programme for teachers in Engineering Colleges and the Faculty Improvement Programme for teachers in Science Colleges, whereby University teachers have been given an opportunity to get their Master's and Ph. D. degrees.

Foreign Collaborative Programmes

There has been a number of programmes in specialised fields in collaboration with different countries. Special mention may be made of the assistance received from UNDP funds by the Industrial Design Centre for the establishment of a model school imparting design education. A collaborative project for starting an offshore engineering centre in interaction with some universities in U. K. has already become operative. Mention may also be made of a faculty exchange programme between the WROCLAW Institute of Technology, Poland and IIT Bombay.

Curriculum Development Centre

The Curriculum Development Centre at IIT Bombay has been very active and has prepared a number of text-books, laboratory manuals etc. In addition, the Centre has also been helping the engineering colleges in the region to frame curricula for engineering and science education.

Sponsored Research and Consultancy

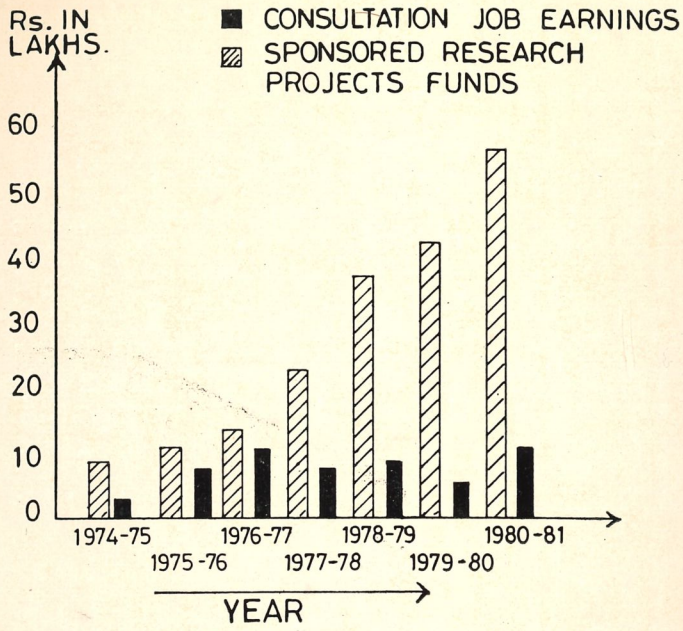
National agencies such as Department of Atomic Energy, Department of Electronics, Department of Science and Technology, Ministry of Defence, CSIR etc. have sponsored projects of interdisciplinary nature to be carried out at the Institute. At present there are over 80 sponsored projects in progress in the Institute. Teams of faculty members drawn from various academic departments and centres of studies carry out such time-bound research-oriented projects. In addition to projects in conventional areas, many projects are in progress in areas of national importance such as energy systems, environmental systems and resources engineering, etc. There are also projects in frontier areas such as semiconductor materials, fibre optics and lasers.

Interaction with Industry

Because of its strategic location in Bombay with its heavy concentration of engineering, chemical and pharmaceutical industries, the Institute is ideally suited to interact effectively with industries. Several consultancy jobs have been carried out involving design and development of process, preparation of feasibility reports, development of special testing facility and individual consultancy for preparing software packages. In addition, a large number of short-term residential refresher courses are organized for the benefit of practising engineers from the industry. IIT-Industries

Get-togethers are held for encouraging interaction between academic departments and concerned industries in the region.

A graphical representation of the growth of sponsored and consultancy projects is given below.



Student Activities and Amenities

The Institute has 9 hostels having 250 rooms each and in addition there is a Ladies hostel having 100 rooms. These hostels are managed by Student Councils, and are independent entities with their own messing facilities, recreation areas, etc. Centralised extra-curricular activities are provided by the Students' Gymkhana. These activities include sports, athletics, cultural programmes, social services and the NCC. Various Clubs of the Gymkhana encourage individual talents of students in hobbies such as painting, modelling, music, photography, aero-modelling and electronic equipment. The beautiful Powai lake offers excellent opportunities to the Boating Club. A swimming pool is a recent addition to the recreation facilities. The Mountaineering Club of the Gymkhana has been very active and has many achievements to its credit.

The important events in extra-curricular student activities include the Inter-IIT Sports Meet held every year at one of the IITs by rotation, in which students of all the IITs compete in a variety of games and athletics. On the cultural side, Mood Indigo is the most important annual event, entirely organized by the students, and is attended by invitees from all over India. This year a new activity called TECHNOFAIR '82 was initiated. TECHNOFAIR is a technological exposition organised by the students and faculty. The aim is to foster meaningful interaction between industries, scientific and research organizations, and students and faculty of the Institute. The students are also encouraged to participate in professional activities through the departmental associations. The Training and Placement office not only organizes practical training programmes for students, but also facilitates students to get proper placements through campus interviews and tests, which are organized by industries and other organisations.

Activities Planned for the Silver Jubilee Year

Being conscious of national needs the Institute proposes to establish two advanced centres of study in the following areas :

1) Centre of Studies in Environmental Science and Engineering.

2) Centre of Studies in Powder Metallurgy and High Temperature Materials.

In addition an Interdisciplinary M. Tech programme in Polymer Science and Engineering is proposed to be introduced.

A large fourth generation computer is also being acquired.

The following International and National Seminars are planned during the Silver Jubilee Year 1982-83 :

1. International Seminars on 'International Co-operation for Higher Education in Science and Technology Perspective for the '90s' (January 1983)
2. 'National Technical Seminars on
   i. 'Recent Advances in Materials Science' (Dec. 1982)
   ii. 'Recent Developments in Environmental Sciences and Engineering' (Feb. 1983)
3. Technical Seminars to be organized by various departments during July-November 1982.

The Institution of a number of Silver Jubilee Chairs is being proposed, some of which are expected to be Endowment Chairs. These Chairs would be in the areas such as Energy, Nuclear Engineering, Management Sciences, Environmental Science and Appropriate Technology. In addition to this a few Institute Fellowships would also be introduced. A scheme is being proposed under which scientists from this Institute would visit some of the countries in the Third World to explore the possibilities of collaboration between this IIT and Institutes of Technology in those countries.

It is intended to conclude the Silver Jubilee Year with a Special Convocation to be held in March 1983.

M. Tech. Programme

Aeronautical Engg,
Chemical Engg.
Civil Engg.
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Materials Science

M. DES Programme

Industrial Design

Ph. D. Programme

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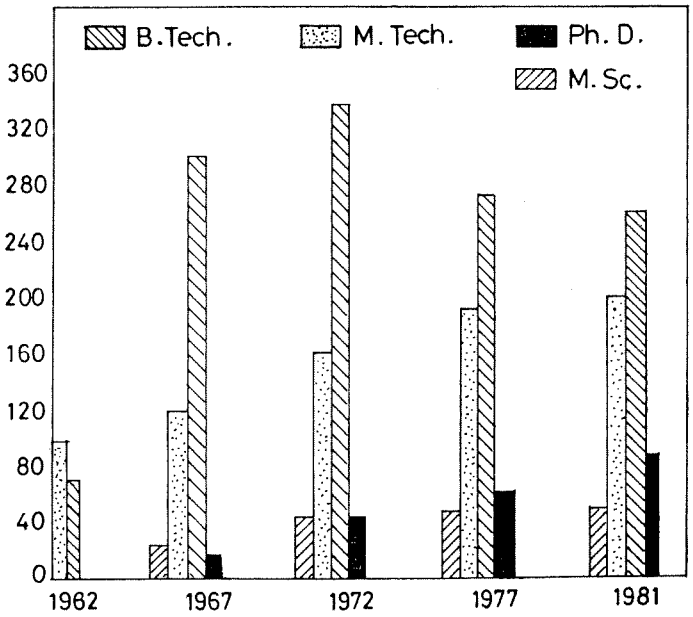

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National agencies such as Department of Atomic Energy, Department of Electronics, Department of Science and Technology, Ministry of Defence, CSIR etc. have sponsored projects of interdisciplinary nature to be carried out at the Institute. At present there are over 80 sponsored projects in progress in the Institute. Teams of faculty members drawn from various academic departments and centres of studies carry out such time-bound research-oriented projects. In addition to projects in conventional areas, many projects are in progress in areas of national importance such as energy systems, environmental systems and resources engineering, etc. There are also projects in frontier areas such as semiconductor materials, fibre optics and lasers.

Interaction with Industry

Because of its strategic location in Bombay with its heavy concentration of engineering, chemical and pharmaceutical industries, the Institute is ideally suited to interact effectively with industries. Several consultancy jobs have been carried out involving design and development of process, preparation of feasibility reports, development of special testing facility and individual consultancy for preparing software packages. In addition, a large number of short-term residential refresher courses are organized for the benefit of practising engineers from the industry. IIT-Industries

R E P O R T

OF

THE INTERNATIONAL WORKSHOP

ON

"NATIONAL ISSUES ON COMPUTERS IN EDUCATION"

HELD AT THE

INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY, INDIA

16th - 18th MARCH 1987

Jointly sponsored by :

Technical Committee 3, International Federation of Information Processing (TC-3, IFIP)

Computer Society of India (CSI)

Indian Institute of Technology, Bombay (IIT Bombay)

CONTENTS

WORKSHOP PROGRAMME

"NATIONAL ISSUES ON COMPUTERS IN EDUCATION"

Dates	:	March 16-19, 1987
Venue	:	Guest House Conference Hall, Indian Indian of Technology, Powai, Bombay 400 076 (India)
Organizers	:	Technical Committee - 3 (Education), International Federation of Information Processing (TC-3, IFIP) Computer Society of India (CSI) Indian Institute of Technology, Bombay (IIT- B)

Day 1 : March 16, 1987 (Monday)

9.00 AM	Registration		
9.30 AM	Inaugural Session		
	Introductory Remarks	:	Prof. B. Nag, Chairman, Organising Committee Maj.Gen. A. Balasubramanian IFIP (India Rep.)
	Keynote Addresses	:	Prof. W. Brauer, Chairman, TC-3, IFIP Prof. H.N. Mahabala, President Computer Society of India.
11.15 AM	Invited Talk	:	Prof. Ashoka Chandra, Educational Adviser (T) Ministry of Human Resource Development, New Delhi 'Indian National Viewpoint on Policies in Computer Education'
11.45 AM	General Discussion on Conduct of Workshop	:	Prof. J.R. Isaac , Programme Coordinator, Outline of Workshop Procedure and Objectives.
2.00 PM	Workshop Technical Sessions*		
5.30 PM			

Day 2 : March 17, 1987 (Tuesday)

9.00 AM	Workshop Technical Sessions*
6.00 PM	

Day 3 : March 18, 1987 (Wednesday)

9.00 AM Workshop Technical Session*
12.15 PM

[NB : *Session titles and panels given in Appendix-I]

1.30 PM Summary/Concluding Session - Chairman : Prof.W.Brauer
6.00 PM

Day 4 : March 19, 1987 (Thursday)

Visit to the Tata Institute of Fundamental Research (TIFR), Computer Maintenance Corporation(CMC) at Nehru Centre, Tata Consultancy Services (TCS) and National Centre for Software Technology (NCST).

Workshop Rapporteurs :

1. Prof. DVR Vithal, Osmania University, Hyderabad
2. Dr. S.C. Mehta, Dept. of Electronics, New Delhi
3. Mr. S.D. Sherlekar, Dept. of CS & E, IIT Bombay

WORKSHOP REPORT

"NATIONAL ISSUES ON COMPUTERS IN EDUCATION"

Bombay, India.

16-18 March, 1987

PREAMBLE

In order to explore the emerging area of computers in education, a three-day Workshop was organised by the Technical Committee 3 (TC-3) of the International Federation of Information Processing (IFIP), the Computer Society of India (CSI) and the Indian Institute of Technology, Bombay, from March 16th, 1987 to March 18th, 1987 at IIT-Bombay. The aim of the Workshop was to produce a **'Working Document'**, which would contain specific conclusions and recommendations on the effective exploitation of computers in education. The Workshop would not be directly concerned with Computer Science education per se, but be concerned with more general aspects of computer science and informatics in the broader context of all education. This was due to the fact that sufficient emphasis had been given to 'learning about computers', while the concept of 'learning with computers' in which the computer, with all its power and flexibility, is merely a tool in the process of problem-solving, had been almost totally neglected despite its very crucial role in all educational activities.

[NB : With due deference to the heterogeneous backgrounds of the Workshop Participants from the world over and their respective perceptions; the words/phrases such as Computers/Computer Science/Informatics/etc., have been used as synonyms, and the reader may substitute the more meaningful/relevant/comprehensive term as per his/her own perceptions].

INTRODUCTION

Sixty participants from twenty-three countries convened to discuss problems related to effectively integrating computers into education. While there was general agreement that all countries are struggling with similar problems, the conclusions and recommendations which follow could be of special significance to educational decision makers in the developing world, as computers can be particularly effective in the task of transforming human resources into powerful components towards progress through training and education.

The use of the computer is all pervading - it reaches out to all disciplines, especially in secondary and tertiary education. This report focuses on the computer as a tool, not on the computer as a subject of study (or informatics).

It was agreed that the computer is a tool which can be a vehicle for economic, social and educational improvement. But this will only happen with national long-term commitment. This commitment must take the form of sufficient funding levels for long-term as well as short-term projects, careful planning and coordination, and especially major support for professional training - which, all agree, is the number one priority. While historically there has been an emphasis on the acquisition of hardware and software, the major problem now facing all nations is a lack of adequately trained teachers. Unless we are able to solve this problem, we will never realize the tremendous potential which the computer provides for giving teachers a tool to improve the quality of education.

We believe that this is a long-term problem that has no simple solution. It is necessary that each country develop its own strategy for best adopting or adapting these 'Conclusions and Recommendations' to its own local environment and situation. There is a universal need for better models, evaluation studies and long range planning in every country, as well as continued cooperation between countries. It is our hope that this report will aid all countries in tacking these very important and difficult problems and issues.

Conduct of the Workshop :

In order to sharply focus on specific issues and themes, and to have in-depth discussions, the Workshop was conducted in ten sessions; followed by a concluding session. Each session was led by a panel of specialists followed by detailed discussions. Each session Chairman submitted the 'Conclusions and Recommendations' of his particular session, and at the final concluding session these were considered by all participants in detail. It was left to a 'Final Draft Sub-Committee' to draw up the Workshop Report in its final form, based on the closing deliberations.

For a general overview of the Workshop deliberations, the ten issues and theme sessions may be considered under four general section headings :-

Section A : The Potential of Informatics in Education

Section B : Computers in Primary, Secondary and Tertiary Education

Section C: Computers in Continuous, Vocational, In-Service, Non-Formal and Distance Education

Section D: Computers in Special Education

SESSION DETAILS

As stated earlier, the Workshop consisted of ten theme and issue sessions which focussed attention on specific topics. The detailed 'Conclusions and Recommendations' drawn up by each of these session panels are given in Appendix-1. These conclusions and recommendations are reproduced as submitted by the panel Chairmen. Though there may appear to be overlaps between some sessions, the exact context of the session must be taken into account.

In the context of the four sub-divisions stated earlier, the sessions may be broadly classified as below :-

Section A : The Potential of Informatics in Education (Theme Session)

Section B : Computers in Primary, Secondary and Tertiary Education

- Session B1 : National Policies in Primary, Secondary and Tertiary Education
- Session B2 : Computer-based-education : Planning, Tools and Infrastructures
- Session B3 : Problems of Implementing Computer-based-education
- Session B4 : Course Modules for Non-Computer Science Students at Tertiary level
- Session B5 : Training Teachers for Informatics

Section C : Computers in Continuing, Vocational, In-Service, Non-formal and Distance Education.

- Session C1 : Computers in Vocational, In-Service and Continuing Education
- Session C2 : Computers in Distance Education
- Session C3 : Computers in Non-Formal Education, including Rural and Adult Education

Section D : Computers in Special Education

- Session D1 : Computers in Education of the Handicapped
- Session D2 : The Development of Non-English Based Computer Systems for Education.

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CONCLUSIONS AND RECOMMENDATIONS OF THE WORKSHOP - IN SUMMARY

Details of the ten theme and issue sessions, the panelists, and the 'Conclusions and Recommendations' drawn by each session are given in Appendix I. However, the major 'CONCLUSIONS AND RECOMMENDATIONS' of the Workshop are summarized below for the benefit of educationists and educational planners at the National level.

I

* 'Learning-with-Computers' offers a very powerful tool for educators, and all efforts must be made to harness the potential of computers and informatics in education. Further, this technology enforces a deeper appreciation of educational pedagogy.

II

* Unless backed by well-planned short and long term projects at the National level, the full potential of this educational technology cannot be exploited. Financial considerations of hardware/software costs should be subservient to educational objectives.

III

* The all-pervasive nature of computers/informatics enforces awareness and literacy programmes, and the exploitation of computer-based technologies in both formal and non-formal educational sectors.

IV

* Computers and informatics should play a supportive role in all educational areas, and the basic principles and methodologies of algorithmic and systems-oriented thinking should be inculcated into traditional/new teaching systems in all disciplines and areas of learning and teaching.

V

* The computer's versatility makes it an ideal tool for special education requirements, such as educational aids for the handicapped and for the mentally retarded. Also, computers can offer multilingual support facilities, widening the sphere of effectiveness into rural areas and breaking down cultural barriers.

VI

* Computer-based-education offers excellent scope for exploiting the 'multiplier-effect' of good teachers, and also can be an effective tool in distance educational systems. This educational technology could therefore have a more encompassing role to play in the developing world.

VII

* The key towards exploiting computer-based technologies lies in effective teacher training. Teachers have to be trained to :-

(a) Accept and adopt computer/informatics-oriented techniques and methodologies into their own teaching, and/or

(b) Teach relevant computer science topics and techniques to make students more competent in their own disciplines.

VIII

* Computer-based national and regional educational testing and information services should be set-up to support educational planning and implementation efforts.

APPENDIX I

SECTION A : THE POTENTIAL OF INFORMATICS IN EDUCATION

Theme Session

Panel : Prof. W. Brauer, Prof. V. Rajaraman, Mr. Peter Bollerslev, Prof.J.R. Choudhury

Preamble

Computer Science should be seen as a discipline of thinking, rather than a subject in the curriculum. This discipline should be integrated in the teaching of all subjects and at all levels.

Conclusions and Recommendations

C1 : The rationale for the overall integration of computer science with education is the role of computers seen in the context of the environment in which we live. Besides opening new ways of thinking, this new tool is a possible vehicle for economic and social improvement.

R1.1 : It should be recognized that computer science and the application of computers form an essential part of all disciplines, and educational policies should take cognizance of this.

C2 : As computer science is all pervading, it is essential in a national policy to specify the priorities, based on the needs and socio-economic considerations.

C3 : There are deeper implications of computer science in education at all levels and in all fields, thus changes ought to take place over a period. Each nation has to determine the levels and fields and also the time-frame for the integration of computer science, based on their national priorities.

R3.1 : As this field is very broad and will require a large commitment of resources, it is essential in formulating policies to set priorities, based on needs and the socio-economic considerations.

C4 : There is a requirement to continuously train teachers in all disciplines in computer science so that they can effectively integrate computer science in the teaching of their own disciplines.

C5 : Computers are a supplementary aid to the teacher in the teaching process, they cannot be a substitute.

R5.1 : Teachers in all disciplines are to be enabled to integrate computer science in the teaching of their own disciplines.

C6 : The introduction of computer science in education is a slow process and thus requires a long term commitment.

R6.1 : As the integration of computer science in education is a slow process, it is essential to commit resources over a long period.

C7 : Appropriate application of computers requires continuous education.

R7.1 : As computer science is a continuously evolving discipline, teachers and professionals are to be continuously educated on the appropriate applications of computers.

C = Conclusions

R = Recommendations

APPENDIX I

SECTION B: COMPUTERS IN PRIMARY, SECONDARY AND TERTIARY EDUCATION

Session B1 : National Policies in Primary, Secondary and Tertiary Education

Panel : Ms. Sandra Wills, Prof.A.K. Jalaludhin, Prof. Todor Boyanov

Preamble

Computers can have an important role to play in primary, secondary and tertiary education as a tool to improve the teaching and learning process. At secondary and tertiary level the computer is often also an object of study.

All countries have been experimenting with computers in education for a number of years and now many countries have national computer education policies built on the feedback from previous activities and projects. Even countries, that do not expect to allocate funds to computer education yet, are developing policies. Policies are a statement of : 1. Why computers might be used (from the political, economic, social, technological and educational perspectives)? 2. What the usage of computers can achieve, given the current resource commitment? 3. How the country intends to go about it? and 4. How the current policy can be evaluated and improved? The word 'teachers' is used in the generic sense to mean educators at all levels.

Conclusions and Recommendations

R1 : National policies should address professional development as the highest priority with excellence as the objective.

R2 : Since professional development is inherently a slow process, adequate time frame must be allowed for in the policy.

R3 : As the technology is rapidly changing in the field, it is necessary for the professional development of teachers to stress the techniques more than the technology. Professional development needs to be on a continuing basis.

R4 : In the development of national policies the consensus and classroom experience of practising educators should be sought. Other representatives of the education community including parents, should also be involved.

R5 : National policies should continually be reviewed in the light of feedback and evaluation from classroom teachers and students.

R6 : Computers in education should be viewed holistically so that the impact on all levels and all subjects is considered simultaneously, though current national priorities may determine major focus on one area at a time. The policy should be built to current or future general educational policies.

R7 : Effort must be made to explore the diverse ways of employing computers to promote new and alternative teaching methodologies. Research should also consider the impact that computer techniques have on changing traditional curriculum content and traditional content boundaries.

R8 : Decisions on ways of using computers in education often reinforce current educational, social, and economic inequities amongst students and amongst teachers. Conscious effort therefore has to be made to counteract such situations.

R9 : In view of rapid obsolescence in this field, it is essential that investments are allocated on a continuing basis for updating systems and software.

R10 : Computers in education cannot be tackled in isolation. It must have the full support of the total infrastructure so that for example professional development is not wasted by being in conflict with administrative procedures or curriculum restrictions,etc.

R11 : The development of national policies benefits from international co-operation in the exchange of information and experience, and therefore should be continued.

APPENDIX I

SECTION B : COMPUTERS IN PRIMARY, SECONDARY AND TERTIARY EDUCATION

Session B2 : Computer Based Education : Planning, Tools and Infrastructures

Panel : Prof. R. Morel, Prof. P. Palchowdhury, Dr. Suresh Wani

Preamble

Traditional educational systems include class-room teaching and distance education in a variety of set-ups. Both formal and non-formal teaching can benefit from the use of computers. The following conclusions were drawn and recommendations made:

Conclusions and Recommendations

C1 : Computers can improve and enrich traditional teaching if courseware/software is adequately designed, developed, evaluated and integrated into teaching and training along with other audio/video techniques.

R1.1 : Design teams should develop adequate models of learning with the help of educational psychologists, subject specialists and experienced teachers.

R1.2 : All computer-based models and teaching aids must be field tested, evaluated and continuously improved.

R1.3 : All teams producing software/courseware should include specialists in graphics, animation and programming. In some cases, gifted school children can be encouraged to contribute to the production.

C2 : Careful planning and evaluation are necessary for any new application of computers on a large scale to education. CAL and CBT tools for relevant topics are to be indigenously developed and tailor-made keeping in view the local requirements. In order to be effective, adequate number of multi-disciplinary CBT packages are required for the teachers.

R2.1: Before computers become a household commonplace, a study of their impact on children should be conducted and the findings made known to the public.

R2.2 : Hardware and software with CAL/CBT features should be provided to teachers engaged in the development and use of CBT.

R2.3 : Teachers should be trained in the use and selection of CAL/CBT.

R2.4 : Development of CAL/CBT courseware should be carried out with teachers in the concerned subject playing the nodal role.

R2.5 : In view of the large magnitude of effort needed in the development of CAL/CBT courseware for different subjects, regional resource centres should be set up.

R2.6 : R and D in the field of CAL/CBT should be supported.

R2.7 : International cooperation in the development and use of CBT material is essential. International bodies like IFIP and UNESCO have to play a leading role in this respect.

C3 : Schools impart three kinds of knowledge : important skills (eg. arithmetic composition), enriching experiences (eg. arts, literature, music) and conceptual material. The use of the algorithmic approach and other appropriate concepts of informatics should be a common aspect of imparting knowledge at all levels.

R3.1 : The algorithmic approach and systems approach should be used as a component in the teaching of all subjects.

R3.2 : School teachers should be exposed to the analysis and design of algorithms and other concepts of informatics as rapidly as possibly so that these approaches could be introduced in the teaching of traditional subjects.

C4 : A minimum quantity of computer resources is necessary for any perceptible impact on teaching.

R4.1 : There are various ways for setting up computer equipment in schools:

a. Computer-rooms intended for use of a whole school should have number of terminals not less than a quarter of the number of pupils in a typical class. Also, an adequate number of peripherals should be included.

b. Integration of computer usage within frontal teaching requires a teacher's work station with adequate large-screen display.

c. School libraries and laboratories should have available one/several work-stations.

d. The set-up should be selected according to the methodologies and the activities planned for.

e. Connecting all school equipment to a local area network, with its advantages and draw backs has to be considered and adequate decisions taken in due time.

R4.2 : The inequality arising due to shortage of resources must be tolerated as a temporary phenomenon, and as a better alternative to sub-threshold investment.

R4.3 : When first introducing computers in schools, it is suggested to give priority to secondary education, before the younger ages.

C5 : A major effort has to be invested for pre-service and in-service training of all members of teaching staff that will be involved in applying informatics in their teaching. This conclusion applies to schools and tertiary institutes as well and especially to teachers' training institutes. It is a basic condition for effective implementation of computer-aided-learning.

R5.1 : The actual investment needed has to be well ascertained, but probably it is of the order of magnitude of the investment for hardware.

R5.2 : The training should include basic, initial learning and continuing updating afterwards.

R5.3 : More advanced training, for specific tasks (eg. computer co-ordinators) should be included in the training programmes.

R5.4 : The training plans should include principals, supervisors and other educational and administrative staff.

R5.5 : Computer curriculae should be introduced in teacher training institutes. Necessary hardware and software should be provided.

APPENDIX I

SECTION B : COMPUTERS IN PRIMARY, SECONDARY AND TERTIARY EDUCATION

Session B3 : Problems in Implementing Computer-Based-Education

Panel : Dr. Ben-Zion Barta, Prof. H.V. Sahasrabudhe, Dr. P.K. Patwardhan

Preable

Traditional educational systems include class-room teaching and distance education in a variety of forms. Both formal and non-formal teaching can benefit from the use of computers. The following conclusions were drawn and recommendations made :

Conclusions and Recommendations

C1 : Computers can improve and enrich traditional teaching if courseware/software is adequately designed, developed, evaluated and implemented.

R1.1 : Design teams should develop adequate models of learning with the help of educational psychologists, subject specialists and experienced teachers.

R1.2 : All computer-based models and teaching aids must be field tested, evaluated and continuously improved.

R1.3 : All teams producing software/courseware should include specialists in graphics, animation and programming. In many cases, gifted school-children can be encouraged to contribute to the production.

C2 : Careful planning and evaluation are necessary for any new applications of computers on a large scale in education.

R2.1 : Before computers become a household commonplace, a study of their impact on children should be conducted and the findings made known to the public.

C3 : Schools impart three kinds of knowledge : important skills (eg. arithmetic, composition), enriching experiences (eg. arts, literature, music) and conceptual material. A common aspect of these is the use of the algorithmic approach.

R3.1 : The algorithmic approach and systems approach should be used as components of the teaching methodology.

R3.2 : School teachers should be exposed to the analysis and design of algorithms and the concept of informatics as rapidly as possible, so that the language of algorithms is used in the teaching of traditional subjects.

C4 : A minimum quantity of computer resources is necessary for any perceptible impact on teaching.

R4.1 : Ideally there should be at least one terminal/work station per four students in a class, with all classes time-sharing the system facilities.

R4.2 : The inequality arising due to implementation of 4.1 (in the light of resource shortage) must be tolerated as a temporary phenomenon and as a better alternative to sub-threshold investment.

R4.3 : Secondary education must be accorded priority for the introduction of computers in schools.

R4.4 : No specific recommendation can abe made on the relative merits of a central system or a local area network, as specific environmental factors and operational needs must be taken into account.

APPENDIX I

SECTION B : COMPUTERS IN PRIMARY, SECONDARY AND TERTIARY EDUCATION

Session B4 : Course Modules for non-Computer Science students at Tertiary Level

Panel : Prof. Robert Aiken, Dr. Douglas S.L. Tung, Prof. J.R. Isaac

Preamble

It is necessary to have at least one introductory course for non-computer science majors at the tertiary level. This course will be composed of various modules that are tailored for the end user and emphasize applications rather than any programming language.

Conclusions and Recommendations

C1 : For the present, computers or informatics need to be included into the curriculum/ syllabus at the University level for non-computer science disciplines. This should be done in a modular fashion.

R1.1 : Course content must be identified in a systematic modular manner depending upon specific requirements of the end user.

R1.2 : The student must be given a full awareness of programming methodologies and the use of packages relevant to his discipline.

C2 : Hands-on-experience must form an integral part of the process of instruction.

R2.1 : Students must be exposed to a wide range of hands-on-experience on word processors, database systems, graphics systems and other such utilities.

R2.2 : Assignments need to include both individual and group projects.

R2.3 : Assignments must be based on discipline-specific problems.

C3 : It is essential that subject-matter specialists be involved in the design and delivery of the course material.

R3.1 : In offering such a course, computer scientists need to utilise the expertise of subject experts, eg. team teaching is one possible approach.

R3.2 : Subject-matter specialists must be involved with the design of laboratory and project work of such a course.

R3.3 : As cross-discipline aspects are involved, due attention and care should be taken in offering teacher re-training. Such training should be offered in a phased manner.

APPENDIX I

SECTION B : COMPUTERS IN PRIMARY, SECONDARY AND TERTIARY EDUCATION

Session B5 : Training Teachers for Informatics

Panel : Prof. A. Bagchi, Prof. D. Schubert, Dr. S.R. Thakore

Preamble

Teachers are needed for exploiting the new educational opportunities opened-up by the information revolution. How do we ensure that there is an adequate supply of trained teachers for teaching computer courses?

Conclusions & Recommendations

C1 : There is a worldwide shortage of teachers in informatics, particularly in developing countries.

C2 : Rapid developments in the computer field call for the training and retraining of teachers on a continuing basis to ensure that they are able to keep abreast with current technology.

R2.1 : Adequate emphasis should be placed on the training and retraining of teachers on a continuing basis.

R2.2 : Appropriate curricula should be developed for the training of teachers at different levels.

C3 : Competent and qualified persons in related disciplines like electronics, mathematics, physics and statistics could be more readily retrained to teach computer courses.

R3.1 : Schemes should be drawn up to retrain competent and qualified persons in related disciplines so that they can teach computer courses.

R3.2 : The non-governmental sector and professional societies should be encouraged to contribute to the teacher training process.

R3.3 : Necessary hardware and software should be made available for teacher training activities.

APPENDIX I

SECTION C : COMPUTERS IN CONTINUING, VOCATIONAL, IN-SERVICE, NON-FORMAL AND DISTANCE EDUCATION

Session C1 : Computers in Vocational, In-Service and Continuing Education (VOICE)

Panel : Dr.P.P. Gupta, Mr. B.V. Chitnis, Mr. R.S. Pawar, Dr. A.S. Induruwa, Ms.Angela Goh

Conclusions and Recommendations

C1 : The need for VOICE is three-fold :

(a) Vocational education or training imparts 'job-oriented' education to people so that they can be directly productive.

(b) Continuing and in-service education ensures that obsolescence will not occur among employed professionals.

(c) Unemployed science graduates (in several developing countries) can be re-trained in information technology (IT) to provide them with employment avenues.

C2 : The problems are :

(a) Requirement of good quality software geared towards the end-user and suitable to local cultural conditions.

(b) Requirement of manpower to develop the required software.

(c) Requirement of sufficient hardware for VOICE programs to be sufficiently meaningful.

(d) In the light of the proliferation of small computer coaching classes, the need for standardization in terms of syllabi and examinations.

(e) Tendency to look upon VOICE courses as 'inferior'.

(f) Necessity of spending time on VOICE programs by busy employed professionals.

R1 : Since the corporate sector is the main beneficiary of VOICE (at least in the long run) it is proposed that

(a) a large part of the funding come from this sector

(b) companies show commitment to release personnel for participation in VOICE programs not necessarily restricted to part-time, weekend or after-office hours courses.

R2 : The Government must encourage corporate sector participation in VOICE by providing appropriate incentives such as tax benefits and import duty exemption.

R3 : VOICE courses be accorded 'due respect'. To ensure this, the development of syllabi be taken up by the Government through various established educational institutions both Government and corporate. Also standardized examinations are to be conducted by Computer Societies, professional bodies or other appropriate agencies.

R4 : Since the software development for computer based education is a complex task, experts in education and the field in question must work together. Various professionals societies and agencies;both national and international, must initiate such interaction through symposia/workshops/joint projects.

R5 : It is stressed that most, if not all, educational software be developed indigeneously. However, rather than re-invent the wheel, it would be advisable to review work done in other countries with a view to using those parts (directly or indirectly) that are relevant. Collaboration with 'culturally similar' countries can be considered. An institute should be set up to train people to develop educational software. Alternatively, Resource Centres affiliated to existing established educational institutions, both Goverment and corporate, be asked to develop such software.

APPENDIX I

SECTION C : COMPUTERS IN CONTINUING, VOCATIONAL, IN-SERVICE, NON-FORMAL AND DISTANCE EDUCATION

Session C2 : Computers in Distance Education/Open University System

Panel : Dr. G. Kovacs, Dr. M.M. Pant, Dr. S. Ramani

Preamble

Distance learning system and Open University system have a very wide and significant scope, especially in the developing countries with scarce resource, in areas of densely populated urban areas as well as in sparsely populated remote areas. They can fulfil the needs of those to whom the formal channels of education are not easily or readily accessible, thereby reducing inequities in the present distribution of educational resources. They are particularly helpful to the handicapped and the economically weaker and socially backward sections of society.

Conclusions and Recommendations

R1 : There is need for international cooperation in exchanging experiences, courseware and the technologies. The proposed working group (WG 3.6) of IFIP TC-3 could enable the possibility or international cooperation in distance learning technology and Open University system.

R2 : Conscious efforts are to be made to ensure that the quality and standards of education and evaluation through the Open University system are comparable with those of the traditional University system.

R3 : Realisation of the above objectives would require inter-alia

(a) use of the latest technologies for mass storage of information and efficient procedures of its organisation and its retrieval.

(b) training of resource persons to handle training through the use of such technologies

(c) special thrust in development of software and courseware particularly adapted to local and cultural considerations.

(d) use of modern computer based testing systems for evaluation of student achievements.

(e) giving adequate attention to the applications of artificial intelligence technology in education, particularly in the Open University and distance education system.

R4 : Importance should be given to the continuing education programmes being conducted by professional societies and institutions in the overall context of distance/open education system. Methods of accredition, recognition and other modes of participation be considered.

APPENDIX I

SECTION C : COMPUTERS IN CONTINUING, VOCATIONAL, IN-SERVICE, NON-FORMAL AND DISTANCE EDUCATION

Session C3 : Computers in non-formal Education, including Rural and Adult Education

Panel : Prof. P.V.S. Rao, Prof. S.C. Bhatnagar, Ms. Anjali Sangvikar

Preamble

For countries with large populations and resource constraints, non-formal education can play a significant role in meeting the educational aspirations of the masses. The computer has the potential to have a significant 'multiplier effect' in terms of good teaching methods, computer-based applications and the use of advanced media technologies. Since the benefits of formal education are only available for a small percentage of the population, non-formal education assumes vital importance. The scope and potential, therefore, needs to be explored and the role computers would play in such a system needs to be identified.

Conclusions and Recommendations

C1 : The role of computers in rural areas can be seen as two fold :
(a) rural development program management
(b) CBL for adult literacy and CBT for functional literacy.

R1.1 : Extensive training on computers is necessary for administrators, clerical and other staff to enable them to implement rural development programs successfully. Rural Development Centres situated in rural areas should be supported to conduct training and experiments in using computers for the benefit of rural populations.

R1.2 : Use of local language, access to personal microcomputers, illustrative examples from rural development programs are essential components of such learning/training programs.

C2 : The potential of computers for making the learning/training process more effective is immense. Computers are to be used along with other aids such as video/ TV/radio. There is no place for dichotomy of rural/urban in regard to relevance of use of computers in education/training.

R2.1 : Select schools/centres to use CBL more extensively. Their experience will benefit usage in other schools.

R2.2 : The computer as a vehicle for education must be continually experimented with. The hardware/software and management problems must be understood so that when the resources are available, their immediate use is possible.

R2.3 : A long term commitment is essential to implement computer awareness, computer literacy and computer-based-learning in the rural areas.

APPENDIX I

SECTION D : COMPUTERS IN SPECIAL EDUCATION

Session D1 : Computers in the Education of the Handicapped

Panel : Prof. P.V.S. Rao, Prof. S.C. Bhatnagar, Ms. Anjali Sangvikar

Preamble

Typical paraplegia and physically handicapped could form valuable human resource inputs for imparting computer education. They are not handicapped as far as receiving computer education is concerned. On the contrary, they have an inherent advantage for iterative types of jobs.

Conclusions and Recommendations

C1 : Computers are specially effective in the education/training of the handicapped as they offer several specialized and appropriate input-outputs devices. Computer training can help them in obtaining gainful employment and in becoming useful citizens. Computers can help the handicapped in acquiring different skills.

R1.1 : High costs and non-availability of computers and supporting equipment for the handicapped inhibit their wide use. The Government must grant concessions for the acquisition of such systems and view it as a necessary social investment. Exchange of information between Technology Development Groups may enable several industries in developing countries to undertake manufacturing of these equipments, so that equipments will be available at low costs.

R1.2 : There should be commitment to experiment and take projects for the handicapped through pilot projects to be implemented by appropriate agencies. It should be recognised that voluntary/professional organisations can play a key role and should be encouraged and funded.

APPENDIX I

SECTION D : COMPUTERS IN SPECIAL EDUCATION

Session D2 : The Development of non-English based computer systems for education

Panel : Dr.PVHML Narasimhan, Mr.T. Nonaka, Dr. N. Reddy

Preamble

Capability to input/output and process local/regional languages is essential for informatics to be utilized in Educational Systems.

Conclusions and Recommendations

C1 : Capability to input/output and process local/regional languages is available at various stages of development. This must be standardised for informatics to be utilized in educational systems.

R1.1 : The techniques employed for different languages should be reviewed to evolve a common scheme of coding and using standard devices.

R1.2 : Govt./Regulatory bodies may be addressed to enforce and promote the standards thus established.

C2 : For the Chinese, Japanese and other Asian scripts multiple versions exist. These may be reviewed in the context of advanced technology solutions.

R2.1 : The professional societies and regulatory bodies should take part in exchange of information/documentation so that standard/compatible codes are evolved and implemented.

C3 : Phonetic based coding and keying could be adopted for full spectrum of applications in Information Technology, viz., Computer I/O and storage, communications and type-setting.

R3.1 : The documentation/reports of national standards may be examined for their correctness and completness for different languages.

C4 : In addition to providing devices for input/output of regional languages, generic software for word processing, text formating, sorting, authoring support etc., are essential for widespread use of CBL.

R4.1 : Generic software packages are to be developed by teams comprising computer scientists and linguists/educational psychologists.

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NATIONAL ISSUES ON COMPUTERS IN EDUCATION

WORKSHOP PROGRAMME

March 16-19, 1987

at

The Indian Institute of Technology, Bombay

REVIEW

Despite the four conclusions, reached by the UN General Assembly as early as 1971 (Please see Workshop brochure), regarding the use of computers in accelerating the process of economic and social development, and international cooperation in this area, a beginning has been made in this regard. The International Federation of Information Processing (IFIP), in recognition of the importance of computers in education, formed the Technical Committee-3 (TC-3) (Education) with the following objectives :-

1. to analyse current technological and social trends and identify new needs and areas for educational activities in information processing;
2. to establish guidelines for comprehensive training programmes and for curricula in informatics;
3. through working groups and conferences in the field of informatics and in its relations to other disciplines, to penetrate new educational needs, areas and/or techniques;
   impacts on education and the various aspects of society, to encourage the dissemination
4. to generate material to acquaint the general public with information processing, including translation of these materials into other languages as feasible and desirable;
5. to establish and maintain liaison with both national and international organisations with allied interests and foster cooperative action;
6. especially to consider the needs of developing countries insofar as is feasible and possible.

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Working groups of TC-3 were formed in the areas of :

Informatics Education at the Secondary Education level;
Advanced Curriculum Projects in Information Processing;
Instructional uses of Computers;
Post-secondary Education and Vocational Training.

The Human Resources Dilemma of the Developing World and the Role of Computers in Edcucation

Most countries of the developing world are confronted with the major problems of restricted resources and over population. However, with international attention turning from an over-indulgence in science and technology towards more 'human' aspects of progress and development, it is felt that excess population can be converted from being economic burdens into productive human resources through education. In fact, with the recognition of education as the key to development, there has been international re-thinking on traditionally established educational institutions, which were modelled on the factory model of mass production aimed at maximum efficiency and reduced costs. There have been criticisms on the 'one-time-learning' approach to education and the 'tyranny of disciplines', which failed to take the current rapid progress in science and technology and the interdisciplinary needs of true progress. Also the impacts of changing educational technologies have essentially been ignored. In Dr. Sylvia Charp's words 'We are still only learning about what can be done with computers in the field of education'.

It is in this context that this Workshop is being organised with a view towards carrying out an in-depth study of the scope of computers in education, and the problems and issues concerned with both the developed and developing world. Unlike many 'high technologies' which have environmental constraints, the education of people all over the world has a high degree of commonality. Educational technologies and computers in education can, with proper planning, play a significant role in the effective development of human resources the world over.

Objectives of the Workshop

The major objective of the workshop would be to utilize the expertise of participants from both the developing and developed worlds to consider indepth

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each others problems and other issues in the area of computers in education. From an understanding of each other's viewpoints, it is expected that the Workshop could produce a 'Workshop Report' with very specific 'conclusions and recommendations' on the use of computers in education. The Workshop Report should aim at offering clear guide lines to national and international bodies and agencies on the scope of computers in education, and the means by which this potential can be harnessed to be most effective in the area of human resources development.

STRUCTURE OF THE WORKSHOP

The Workshop will first focus attention on the broader aspects of informatics in education at national levels. This will be followed by five major policy-level themes concerned with computers in education. However, adequate time will be set aside for in-depth considerations of the various issues and problems that underlie implementations aspects of these themes. Based on these deliberations, it is proposed to draw up conclusions and recommendations that will be of significance to national and international agencies concerned with education.

The Workshop will be organised into five Sections :

1. National Aspects of Informatics in Education
2. Theme Sessions
3. Issues Sessions
4. Conclusions and Recommendations
5. Closing Session.

1. NATIONAL ASPECTS OF INFORMATICS IN EDUCATION

Representatives of IFIP and the Computer Society of India will briefly introduce the main theme of computers in education, to be followed by a keynote address. The representative from the organising committee will outline in detail the structure of the proceedings to follow.

2. THE THEME SESSIONS

(a) Theme I : **The Role of Computer Science Education**

As computer science education would be instrumental in promoting the

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exploitation of computers in development, and education in particular, due importance should be given to its inclusion into the various educational levels, and also in promoting computer literacy and awareness among the general public.

(b) Theme II : **Secondary and University Education**

Formal educational systems must necessarily include computer studies from two points of view : (i) As an effective tool in supporting and promoting studies in humanities, science and technology; and (ii) As a new and effective tool in educational technology.

(c) Theme III : **Vocational, Continuing and In-Service Education**

In the information age, traditional formal educational systems must necessarily be supplemented or augmented by vocational, continuing and in-service educational systems. Many of these systems will heavily exploit the potential of computers in teaching, learning and training systems.

(d) Theme IV : **Distance Education/Open University Systems**

Distance education and Open University systems have made some progress in the developed world. However, the potential importance to the developing world need hardly be stressed. It is essential to identify ways and means of promoting this form of education, especially in high population countries.

(e) Theme V : **Non-formal Education; including rural, and adult education, and education for the handicapped**

In the current context, formal education can be offered to only a small percentage of the population and hence non-formal education must play a vital role. The scope and potential of non-formal education systems must be explored, and the role to be played by computers in such systems identified.

3. THE ISSUES SESSIONS

(a) Issue I : **How can computers be integrated into the present curriculum?**

How best can computer science, literacy and awareness be integrated into the present educational system? In particular, how can they be integrated into the curriculum?

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(b) Issue II : **What are the tools and other infrastructure required?**

How best can computer assisted/aided instruction/learning/training systems be exploited? What role do intelligent tutoring systems, expert systems and other artificial intelligence oriented systems play? What role do special purpose hardware/ software systems play in education? What are the problems of teacher acceptance, courseware development etc.?

(c) Issue III : **How can non-English based computer teaching systems be evolved?**

What are the problems connected with the inclusion of various languages in computer based education? What about the scripts - i.e. input/output equipments?

(d) Issue IV : **How best can computer-based educational techniques be included into traditional teaching systems and methodologies?**

Can computer based teaching systems enhance or augment the teaching of physics, chemistry, mathematics, humanities, languages, management, etc.? How can the most effective topics for this mode of instruction be identified?

(e) Issue V : **How can the complex problem of Teacher Training be tackled?**

Teachers, being the key to the educational process, must be trained to accept and effectively exploit new educational technologies - how best can this be done?

4. CONCLUSIONS AND RECOMMENDATIONS

The final day of the Workshop will be set aside for drawing up specific conclusions and recommendations as an outcome of the Workshop deliberations.

5. CLOSING SESSION

The conclusions and recommendations of the Workshop will be formally presented, and the Workshop concluded.

Holiday Inn

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37.	**Prof. Vithal D.V.R.**	Computer Science Osmania University HYDERABAD 500 007	NITIE
38.	**Mr. Wani Suresh**	Vice President Tata Burroughs Ltd Manish Commercial Centre 216-A, Dr. A.B. Road, Worli BOMBAY 400 025	---
39.	**Prof. Isaac J.R.**	Dept. of Computer Sc. & Engg IIT Bombay 400076	A-9, IIT Campus
40.	**Prof. Rao S.S.S. P.**	Head, Dept. of Computer Sc. & Engg. IIT Powai, Bombay 400 076	C-97, IIT Campus
41.	**Dr. Albal S.V.**	Manager (Training), NELCO Mahakali Caves Road, Chakala Bombay 400 093	
42.	**Mr. Sherlekar S.D.**	Computer Sc. & Engg IIT Bombay	

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TC - 3 MEETING

Dates : March 12 & 13, 1987
The meeting begins on March 12,1987 at 2 PM . On March 13, 1987 it begins at 10 AM
Venue : Guest House Conference Room
Indian Institute of Technology,Bombay

PC MEETING OF WCCE

Date : March 14, 1987
Meeting begins at 10 AM
Venue: Guest House Conference Room
Indian Institute of Technology,Bombay

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3. Venue of TC-3 Meeting/Workshop

1. Mostly Conference Room of IIT Guest House

2. Other venues for social events will be announced later. Transport will be arranged for these.

3. Time permitting, a bus will be arranged on the last day (19th March) for visits to selected centres and shopping.

4. Campus contacts (for assistance)

1. For messages and other information	:	IIT Telephone Operator Tel. 581421 Internal Tel : 769/369
2. For clerical/office support Xeroxing etc.	:	Mr. Naik/Mr. Murthy (PS/PA to Director) Tel : 581772 Internal : 621/783
3. Prof. S.S.S.P. Rao C-97, IIT Campus	:	Tel : 584314 Res. : 588940 Internal : 506 Res. : 624
4. Prof. J.R. Isaac A-9, IIT Campus	:	581421 Internal : 456 (Office) Res: 748
5. Prof. B. Nag	:	581772
Director's Bungalow, IIT Campus	:	Res. 581234 Internal 620 Res. 760

5. For Foreign Participants

1. Passport/Visa formalities	:	Check with Embassy/Trade Commission in your country. They could also inform you of customs formalities.
2. Travellers Cheques/foreign currency	:	Can be changed at airport or at banks in town or at hotels. State Bank at IIT Campus can change Travellers Cheques.

(NB : Please note that all foreign visitors must meet all hotel bills in foreign (hard) currency - and not in Indian Rupees).

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3. If you are reaching Bombay from abroad, you will land at Sahar Airport (as stated earlier). If confirmed arrival information is with us and there are no inordinate flight delays, you will be met at the Airport by our representatives carrying an **'IIT BOMBAY'** placard. However, if any delay, please take a pre-paid taxi to IIT-Powai or your hotel.

4. Diners cards/Credit cards : Can be used only at larger hotels and Stores.

   Approximate exchange rates : 1 US dollar = Rs.13 (approximately)
   1 Pound Sterling = Rs.20 (approximatly)

5. If departure from Sahar Airport, there is an airport fee of Rs.100/-

6. The main language used in Bombay is Hindi, very many people do understand English.

6. Enclosed

1. Map of Campus
2. Map of Bombay
3. Information booklets on IIT.

We look forward to meeting you.

(B. Nag)
Chairman, Organising Committee

WORKSHOP PROGRAMME

"NATIONAL ISSUES ON COMPUTERS IN EDUCATION"

Dates	:	**MARCH 16 - 19, 1987**
Venue	:	**Guest House Conference Hall, Indian Institute of Technology, Powai, Bombay 400 076 (India)**
Organizers	:	Technical Committee - 3, International Federation of Information Processing (TC-3, IFIP) Computer Society of India (CSI) Indian Institute of Technology, Bombay(IIT-Bombay)

NB : Further particulars please refer to 'Details of Programme Sessions'

DAY I : March 16, 1987 (Monday)

9.00 AM	Registration		
9.30 AM	Inaugural Session		
	Introductory Remarks	:	Prof. B. Nag, Chairman, Organising Committee Maj.Gen. A. Balasubramanian
	Keynote Addresses	:	Prof. W. Brauer, Chairman, TC-3 Prof. H.N. Mahabala, President Computer Society of India.
11.00 AM	Tea Break		
11.15 AM	Invited Talk	:	Prof. Ashoka Chandra, Educational Adviser, Ministry of Human Resource Development, New Delhi. 'Indian National Viewpoint on Policies in Computer Education'
11.45 AM	General Discussion on Workshop.		
12.30 PM	Lunch		
2.00 PM	**THEME I**	:	**'The Role of Computer Science Education'**
3.30 PM	Tea Break		

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3.45 PM	**THEME II**	:	**'Primary, Secondary and University Education'**
5.15 PM	End of Session		

DAY 2 : March 17, 1987 (Tuesday)

9.00 AM	**THEME III**	:	**'Vocational, Continuing and In-Service Education'**
10.15 AM	Tea Break		
10.30 AM	**THEME IV**	:	**'Distance Education/Open University Systems'**
12.15 PM	Lunch		
1.30 PM	**THEME V**	:	**'Non-Formal Education, including rural and adult education and education for the handicapped'**
3.15 PM	Tea Break		
3.30 PM	**ISSUE I**	:	**'How can computers be integrated into the present curriculum?'**
4.45 PM	**ISSUE II**	:	**'What are the tools and other Infrastructure required?'**
6.00 PM	**ISSUE III**	:	**'How can Non-English based computer teaching system be evolved?'**

DAY 3 : March 18, 1987 (Wednesday)

9.00 AM	**ISSUE IV**	:	**'How best can computer-based educational techniques be included into traditional teaching systems and methodologies?'**
10.15 AM	Tea Break		
10.30 AM	**ISSUE V**	:	**'How can the complex problem of teacher training be tackled?'**
12.15 PM	Lunch		
1.30 PM	**SUMMARY SESSION**		

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rapporter : Prof. C.R. Muthukrishnan, IIT Madras
Dr. U.P. Phadke, DOE, New Delhi
Dr. S.C. Mehta, DOE, New Delhi
Dr. DVR Vithal, Osmania University, Hyderabad
Mr. S.D. Sherlekar, CS&E, IIT Bombay

DETAILS OF WORKSHOP PROGRAMME SESSIONS

The Workshop is organized into four sections (as given in the already distributed 'Workshop Programme'):-

1. Inaugural Session : National Aspects of Informatics in Education
2. Theme Sessions
3. Issue Sessions
4. Summary Session : Conclusions and Recommendations

Suggestions have been received from some participants that, as time is short, there should be a clearer 'focus' on the themes and issues to be deliberated on at the Workshop in order to make sessions more effective and to prevent wasteful overlaps.

The organisational details are as follows :-

1. **INAUGURAL SESSION** : Various concerns regarding 'National Aspects of Informatics in Education', with the 'focus' as given below.

2. **THEME AND ISSUE SESSIONS** : A panel (of two to four members) will be identified for each of these sessions. It will be the panel's responsibility to decide on the mode of conduct of the session. In general, the panel will present its views through individual or group presentations, based on papers, experiences or case studies of relevance; which would focus attention as required. After about 30 to 45 minutes presentation, the topic will be thrown open for discussion. At the end of the session, the panel will prepare a brief 'Session Report'.

3. **NOTE ON THEME, ISSUE AND SUMMARY SESSIONS :**

   1. **Theme Sessions** : These are intended to serve as pointers towards drawing conclusions on broad policy issues concerning computers and education. What decisions have to be made at various levels of educational management in order to fully utilize the potential of emerging computer based educational technologies, and associated improvements in mass communication?

   2. **Issue Sessions** : These are intended to serve as pointers towards drawing up recommendations by which this potential can be effectively tapped. They are concerned with how the emerging educational techniques and technologies can be used, and hence are related to the mechanics of implementation.

(NB: For computer specialists, 'Themes' may be considered analogous to 'architecture' (ie : What facilities?), while 'Issues' may be considered analogous to 'organisation' (ie : How implemented?).

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3. **Summary Session** : The 'Theme' and 'Issue' Sessions should offer deep insights into the potential of emerging educational technologies and how they should be effectively incorporated into educational planning and management. 'Conclusions and Recommendations' can be drawn up as national educational guidelines to organisations and bodies.

4. **THEME SESSIONS** :

Theme I : **The Role of Computer Science Education**
Focus : This Workshop is not directly concerned with the aspect of 'Leraning about Computers', which is concerned with computer science/technology/engineering. However, we are concerned with these aspects in their supportive role of 'Learning with Computers'. Also, computer awareness among the general public and computer literacy must necessarily play effective supporting roles in promoting the acceptance of emerging educational technologies.

Theme II : **Primary, Secondary and University Education**
As stated, formal and informal educational systems must necessarily include aspects of computer studies from two points of view : (i) As an effective tool in supporting and stimulating the effective use of computer related techniques and methodologies in the study of humanities, science and technology (numerical analysis, graphics, data-bases, simulation, etc), and (ii) As a new and effective tool in educational technology (computers in various levels of application, courseware as support).

Theme III : **Vocational, Continuing and In-Service Education**
In the information age, traditional formal educational systems must necessarily be supplemented or augmented by vocational, continuing and in-service educational systems. However, not only must teaching and learning patterns accept new educational technologies, but educational planning and management systems need reconsideration.

Theme IV : **Distance Education/Open University Systems**
While these systems have had some success in the developed world, a much wider and far more significant scope for them lies in the developing world in areas of over-population or, oddly enough, sparse-population. However, this scope at present lies totally untapped; and yet must necessarily play a significant role ultimately. How can this potential be tapped?

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Theme V : **Non-formal Education - including rural/adult education, and education for the handicapped**
For over-populated, resource-constrained nations this aspect must ultimately play a significant role, however, is beset by apparently insurmountable hurdles. With the potential to have a significant 'multiplier effect' of good teaching methods, computer-based methods could offer a solution and hence this area must be explored. As has been pointed out, education for the handicapped has been forced into this theme only on the basis that it is essentially non-formal. Further, sufficient progress has not been made in this area to warrant separate consideration.

5. ISSUE SESSIONS :

Issue I : **How can computers be integrated into the present curriculum?** How best can adequate knowledge about computers, computer techniques and methodologies, be integrated into present curriculae? Similarly, h o w can computer literacy and computer awareness be provided at the levels required?
(NB : This is not concerned with regular computer science/technology/engineering courses/programmes which have well accepted expectations and specifications).

Issue II : **What are the tools and other infrastructure required?** As stated earlier CAI/CAL/CAT/CBT/ICAI/ES are established tools in educational technology. However these are beset by problems of cost, hardware/software costs, lack of teacher acceptance, inadequate courseware, non-participation of teachers in courseware development, etc.

Issue III : **How can non-English based computer teaching systems be evolved?**
While there is easy acceptance of the fact that computer-based education can have a significant role to play in the developing world; it has also to be noted that there is very little activity on computer-based processing in local languages. Obviously in order to gain international significance, attention must be given to this aspect. Apart from the processing, which can be reduced to standard symbol manipulation methods, due attention must be given to input/output handling devices in these languages.

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Issue IV : **How best can computer-based educational techniques be included into traditional teaching systems and methodologies?**

Quite rightly, it has been pointed out that these new technologies should not be 'included into traditional teaching systems' (as they would no longer be traditional). To be effective, teaching systems and methodologies must also not attempt to 'leap-frog' - as education must necesarily be an evolutionary process. How then can new educational technologies be exploited to enhance and augment the effectiveness of teaching traditional courses in Physics, Chemistry, Mathematics, Humanties, etc.? Management education is an area in which computers could play a significant role.

Issue V : **How can the complex problem of teacher training be tackled?**

Teachers, being the key to the educational process, must be trained to not only accept but also effectively exploit new educational technologies. In fact in some cases there has been a tendency to hand over courseware development to professional agencies, thus taking away the initiative from the teacher. Since teacher training is the first hurdle to surmount, how best can this be done?

6. SUMMARY SESSION : **Conclusions and Recommendations**

The effectiveness of the Workshop will be reflected in these summary discussions, and in the final conclusions and recommendations that can be drawn up. As there will be international participation involving numerous educational experts from both the developed and the developing world, the conclusions and recommendations drafted should be of significance to various national educational planning agencies and organisations.

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NB : At the time of the Workshop, all participants will be given a brochure containing relevant background papers and other relevant information.

WORKSHOP : THEME SESSIONS

Panel members:

THEME I	**The Role of Computer Science Education**
16.3.1987	Prof. W. Brauer, Prof. V. Rajaraman, Mr. Peter Bollerslev,
2.00 - 3.30 PM	Prof. J.R. Chowdhury
THEME II	**Primary, Secondary and University Education**
16.3.1987	Ms. Sandra Wills, Prof. A.K. Jalaludhin, Prof. Todor Boyanov
3.45 - 5.15 PM	Prof. Harun AR Rashid
THEME III	**Vocational, Continuing and In-Service Education**
17.3.1987	Dr. P.P. Gupta, Mr. Robert Iau, Mr. B.V. Chitnis, Mr. R.S. Pawar
9.00 - 10.15 AM	Dr. A.S. Induruwa
THEME IV	**Distance Education/Open University Systems**
17.3.1987	Dr. G. Kovacs, Prof. Ram Reddy
10.30 - 12.15 PM	
THEME V	**Non-formal Education, including Rural and Adult Education and Education for the Handicapped**
17.3.1987	Prof. P.V.S. Rao, Dr. S. Ramani, Prof. S.C. Bhatnagar
1.30 - 3.15 PM	Ms. Anjali Sangvikar

WORKSHOP : ISSUE SESSIONS

Panel Members:

ISSUE I	**How can Computers be integrated into the present curriculum?**
17.3.1987	Prof. Robert Aiken, Dr. Douglas S.L. Tung, Prof. J.R. Isaac
3.30 - 4.45 PM	
ISSUE II	**What are the tools and other infrastructure required?**
17.3.1987	Prof. R. Morel, Prof. Palchowdhury, Dr. A.G. Rao
4.45 - 6.00 PM	
ISSUE III	**How can non-English based Computer teaching systems be evolved?**
17.3.1987	Prof. T. Nishimura, Dr. P.V.H.M.L. Narasimhan, Dr. R.K. Sen
6.00 - 7.15 PM	
ISSUE IV	**How best can computer based educational techniques be included into traditional teaching systems and methodologies?**
18.3.1987	
9.00 - 10.15 AM	Dr.Ben-Zion Barta, Prof.H.V. Sahasrabudhe, Dr. P.K. Patwardhan
ISSUE V	**How can the complex problem of teacher training be tackled?**
18.3.1987	Prof. A. Bagchi, Prof. D. Schubert, Dr. S.R. Thakore
10.30 - 12.15 PM	

TC-3 PARTICIPANTS

Sr.No.	Name	Staying at	Room No.
1.	**Mr. Bollerslev Peter**	IIT Guest House	13
2.	**Prof. Boyanov Todor**	IIT Guest House	17
3.	**Prof. Brauer W**	IIT Guest House	01
4.	**Dr. Kovacs G**	IIT Guest House	15
5.	**Prof. Morel R**	Hotel Holiday Inn	
6.	**Prof. Nag B**	Director's Bungalow IIT	
7.	**Prof. Nishimura T**	IIT Guest House	21
8.	**Dr. Schauer H**	IIT Guest House	11
9.	**Prof. Schubert D**	IIT Guest House	23
10.	**Prof. Verrijn-Stuart A.A.**	IIT Guest House	25
11.	**Dr. Wiechers G**	IIT Guest House	02
12.	**Ms Wills Sandra**	Centaur Juhu Beach Hotel	
13.	**Mr. Arvid Staupe**	IIT Guest House	16
14.	**Prof. Aiken Robert**	IIT Guest House	12
15.	**Mr. Nonaka T**	IIT Guest House	14

Prof R Morel
Holiday Inn

WORKSHOP PARTICIPANTS

Staying at IIT Guest House

Sr.No.	Name	Address	Room No.
TC-3 Members			
1.	**Mr. Peter Bollerslev**		13
2.	Prof. Todor Boyanov		17
3.	Prof. W. Brauer		01
4.	Dr. G. Kovacs		15
5.	Prof. R. Morel		Holiday Inn
6.	Prof. T. Nishimura		21
7.	Prof. D. Schubert		23
8.	Prof. A.A.Verrijn-Stuart		25
9.	Ms Sandra Wills		Centaur Juhu Beeach
10.	Mr. Arvid Staupe		16
11.	Prof. Robert Aiken		12
12.	Mr. Nonaka T		14
13.	Dr. Ben-Zion Barta		19
Others			
1.	Mr. S.K. Chu	Bangkok	11
2.	Maj.Gen.Balasubramanian	Madras	18
3.	Dr. A.K. Jalaludin	NCERT, New Delhi	20
4.	Prof. H.N. Mahabala	IIT Madras	22
5.	Prof.C.R.Muthukrishnan	IIT Madras	Suite 04
6.	Prof. D.V.R. Vithal	Hyderabad	Suite 04
7.	Prof. V.Rajaraman	Bangalore	24

WORKSHOP PARTICIPANTS

Staying at NITIE Guest House

S.No.	Name	Address	Room No.
1.	**Dr. S.C. Mehta**	DOE, New Delhi	B-4, Room No.2
2.	**Dr. Rajendra Pawar**	NIIT, New Delhi	VIP Suite
3.			
Foreign participants			
1.	**Prof. J.R. Chowdhury**	Bangladesh	B-4, Room No.1
2.	**Dr. A.S. Induruwa**	Sri Lanka	B-6, Room No.3
3.	**Dr. Abdul Aziz Khan**	Pakistan	B-5, Room No.1
4.	**Prof. S. Karunaratne**	Sri Lanka	VIP Suite
5.	**Mr. C.F. Lau**	Malaysia	~~B-6, Room No.2~~ Centam Juhu Beach
6	**Mr. Tea-Jung Kim**	Korea	B-5, Room No.2
7.	**Dr. M.A. Rahman**	Pakistan	B-5, Room No.3
8.	**Prof. Harun AR Rashid**	Bangladesh	B-4, Room No.3
9.	**Mr. Hari Gopal Shrestha**	Nepal	B-6, Room No.1
10.	Dr. Douglas SL Tung	Hongkong	VIP Suite *

* Subject to confirmation

WORKSHOP PARTICIPANTS

Staying at BARC Guest House

S.No.	Name	Address
1.	**Prof. A. Bagchi** (NITIE) — staying	IIM Calcutta
2.	**Prof. S.C. Bhatnagar**	IIM Ahmedabad
3.	**Mr. M. Derkatch**	Unesco, New Delhi
4.	**Dr. PVHML Narasimham**	CMC, Secunderabad
5.	**Prof. P. Palchowdhury**	IIT Kharagpur
6.	**Col. M.P. RAo**	CSI, Secunderabad
7.	**Mr. Kumar Reddy**	CMC, Secunderabad
8.	**Mr. Naresh Reddy**	CMC, Secunderabad
9.	**Dr. G. Ram Reddy/Dr.M.M.Pant**	Indira Gandhi Open Univ,Delhi
10.	**Prof. H.C. Sahasrabudhe**	Pune University, Poona
11.	**Dr. R.K. Sen**	IIT Kharagpur
12.	**Prof. S.R. Thakore**	Ahmedabad 380 007

WORKSHOP PARTICIPANTS

Staying at Hotel

Sr.No.	Name	Address	Name of Hotel
1.	**Mr. Geh Ik Hoon**	Singapore	Centaur Juhu Beach
2.	**Mr. Chia Tech Khiam**	Singapore	Centaur Juhu Beach
3.	**Dr. Angela Goh**	Singapore	Centaur Juhu Beach
4.	Dr. Douglas SL Tung	Hongkong	Holiday Inn *

* Subject to confirmation

WORKSHOP PARTICIPANTS

From Bombay

Sr.No.	Name	Address
1.	Shri B.V. Chitnis	TCE, Bombay
2.	Dr. P.P. Gupta,	CMC, Bombay
3.	Dr. Nirmal Jain	TCS, Bombay
4.	Shri F.C. Kohli	TCS, Bombay
5.	Dr. O.P. Mehra	IDM, Bombay
6.	Dr. M.P. Nawalkar	BARC, Bombay
7.	Dr. P.K. Patwardhan	BARC, Bombay
8.	Prof. P.V.S. Rao	TIFR, Bombay
9.	Dr. A.G. Rao	TCS, Bombay
10.	Dr. S. Ramani	NCST, Bombay
11.	Kum. Anjali Sangvikar	TIFR, Bombay
12.	Mr. H.S. Sonawala	Hindtron, Bombay
13.	Mrs. L. Saldana	Leading Edge P.Ltd., Bombay
14.	Mr. Suresh Wani	TBL, Bombay
15.	Dr. S.V. Albal	Nelco, Bombay
16.	Prof. B. Nag	IIT Bombay
17.	Prof. J.R. Isaac	IIT Bombay
18.	Prof. S.S.S.P. Rao	IIT Bombay
19.	Mr. S.D. Sherlekar	IIT Bombay

TC 3 - WG.3.6 Distance Learning

Scope and Aims

I. SCOPE

1.1. To investigate distance learn;ing methods for adult education in informatics in the Open Universities.

1.2 To introduce the methods of distance learning to post-graduate training on different levels.

1.3 To realize the connection and the cooperation of the distance learning educational systems with other public and high-level education system

1.4 To cooperate with the telecommunication-media (TV, Radio journals etc.)

2. AIMS

2.1 To prepare the whole society for living in the information-age, using a distance learning system for

- teaching the application of intelligent electronic tools, as computers, terminals, CNC equipment etc.,
- teaching possible use of informatics (data-banks, information systems, program packages, software tools etc.) and the handling of such systems.

2.2 To investigate the technology of distance learning, to be aware of the new and advanced methods and to support the spread of distance learning in the educational institutions of the different countries.

2.3 To support the teaching of Informatics with the technology of distance learning, particularly in the countries where this technology is not currently applied.

2.4. To support cooperation, especially in the development of courseware and the exchange of teaching material (courseware).