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ABSTRACT

This report contains excerpts from papers and summaries of discussions and program actions carried out during a series of seminars held to establish research priorities under the Information Technology and Education Programme (ITE) in the United Kingdom. The seminar on "Information Technology" (IT) included Kenneth Ruthven's consideration of IT content and methodology; Tony Scott's presentation of the aims, course descriptions, and key features of The London Borough of Croydon's computer studies courses; and John Gardner's presentation on the teacher's role in raising the levels of IT literacy, clarification of the meaning of IT literacy, and the need for evaluation of IT techniques in education. The seminar on "Implanting Innovation and Teacher Education" included discussions of changes that are needed/anticipated in education as a result of the availability and adoption of IT, the barriers to change, IT based materials, and the teacher's relationship with class members. The last seminar, on "Artificial Intelligence and CAL Development," commenced with a consideration of a range of issues prepared by Bob Hart, which included the meaning of computer assisted learning (CAL); using the computer to help the child transcend physical and computational limits; the development of applications that transcend the traditional curriculum barriers; creative media; support for the teacher; program designs that allow children to break out of strait jackets of arbitrary structures; and the role of research. Other points discussed were reflected in a summary paper by Tony Scott from which several excerpts are given in this report. Appendices include a list of attendees and a discussion of ways in which ITE plans to promote applications of artificial intelligence in education. (DJR)

SPRING SEMINAR REPORTS R. Lewis, May 1985

Three seminars were held during the spring on the themes -

Information Technology Literacy
Implanting Innovation and Teacher Education
Artificial Intelligence and CAL development

These form key areas of interest to the Programme though this will not exclude work in such areas as

Problem solving
and Learner Machine Interface both of which are important to the other themes.

The seminars considered the problem facing the Programme of identifying priorities for action under the three foci. Those able to attend came from a variety of institutions and represented differing viewpoints (see Appendix A for the list of attendees).

Two major issues arose in all the seminars:

- should the Programme concentrate on research concened with short-term changes brought about by IT or should the emphasis be on learning possiblities in the next century?

- to what extent should the program be restricted to a particular level of education, for example, secondary schools?

Both issues require detailed thought.

Whilst there is some attraction in looking ahead, it is questionable if the Programme would be justified in working for three years on a basis of economic and social imponderables. The credibility of its work in many quarters will be judged by the tangible impact that it has on education at the turn of the decade. Teachers and many others in society are deeply concerned about the education of the present generation of young people.

With regard to limiting the program to a particular sector of education (to increase the impact of its limited resources), this policy could prevent the transfer of its findings across the artificial (in cognitive terms) boundaries which currently exist but which are subject to change. As expanded later, it could also cut off the Programmme from important sources of financial and other support.

In each of the seminars there was a wide ranging discussion over 24 hours and, naturally, this discussion strayed at times from the main theme. In many cases attendees wrote later clarifying their views and these letters have been most helpful. The main issues are summarised in the following sections.

Note: The views expressed or implied in this document are those of the seminar attendees or the Programme Coordinator and not necessarily those of the Education and Human Development Committee of ESRC.

SEMINAR 1: INFORMATION TECHNOLOGY LITERACY

The questions posed to members of the seminar were:

- Can it be achieved by changes in the methodology of existing curriculum areas in schools and colleges?
- Is it achieved by TVEI-like strategy?
- Does `literacy begin at home'?

A number of papers were tabled. Of these, Kenneth Ruthven's outline considers both content and methodology:

> "IT literacy, while widely argued for, is far from well defined. Present practice often seems to lack theorisation of its goals: development has been largely bottom-up, and has produced a situation in which IT literacy is seen as a rag-bag of topics often over concerned with the state of the technology, and centred on the `use' and `appreciation' of IT. It seems to me that the knowledge and skills constituting IT literacy are concerned with: the mechanisms underlying the working of the technology; the techniques required to make use of the technology; the functions which the technology is capable of carrying out; the applications of the technology to real problems; the social context and implications of the technology. What we lack at present are clear analyses of key concepts and organising principles for the field.
>
> Similarly, little attention has been paid to children's conceptualisation of IT: to take just one example, are children sensitive to the way in which the computer can mediate very different knowledge systems into superficially similar forms; can they, say, tell the difference between monitoring a scientific experiment and simulating it; what kind of mental models have they of the processes which produce the visual display, and how do they interpret the display? There is a pressing need to explore such educational aspects of the man-machine interface and to develop an informed pedagogy of knowledge and information systems.
>
> There are essentially four curriculum strategies for achieving IT literacy; separation through the introduction of a distinct curricular unit - to date, computer studies, or, more recently, IT studies; dispersion of different elements to other curricular units - programming to mathematics, word-processing to English, implications to social studies; absorption within a larger curriculum unit - traditionally mathematics, but perhaps, in the future, technology; permeation throughout the curriculum through routine contact with the technology and its products. Each has strengths and weaknesses, and case studies of schools adopting different approaches might help to highlight these.
>
> In many ways, this is an unpromising decade for innovation. Education is on the defensive; by 1990,

> around 65% of teachers will be aged 40 or over; over the next five years, the annual proportion of new entrants will be around 3%; opportunities for promotion are limited; resources are scarce. Even if this were not the case, the evidence of the past is that while it is relatively easy to change the content of the curriculum, changing teaching styles and curricular values is much more difficult, giving rise to the phenomenon of innovation without change. It is hardly surprising, then, that the major response of educational institutions under pressure to `do something about computing' has been to opt for the separation strategy, in the form of distinct courses in computer studies or information technology. Any strategy for IT literacy must recognise and address itself to such factors."

The last paragraph highlights key questions; in particular, the figures concerning the teaching force imply that it is in-service education which holds the key to short-term change.

The London Borough of Croydon (adviser Paul McGee, represented at the seminar by Tony Scott) has a long history of computer studies courses in its schools. The aims of their current IT course are stated as follows:

> "The general aims of the course are to ensure that all pupils:
>
> i) have a practical awareness of what characterises information processing - including control technology - and the use of computer based information systems;
>
> ii) are aware of major developments in technology affecting communication of information;
>
> iii) experience the use of modern communication devices and systems in some worthwhile way;
>
> iv) use computers to perform useful activities which would be unduly tedious otherwise and hence develop a practical understanding of problem solving using computers;
>
> v) have sufficient familiarity with common electronic communication systems to have no irrational fear of them;
>
> vi) develop the understanding and confidence to use Information Technology to enrich their everyday lives;
>
> vii) develop a basic understanding of the principles underlying Information Technology so that they can cope with changes in technology. "

The course content is then described:

> "Information Technology in school is about information and communication. Information can be collected,

stored, accessed, manipulated and transmitted. How these activities are handled provides an IT syllabus. A syllabus to cover an area as diverse as information handling needs to look closely at the impact of IT in all applications relevant to the pupil, for example at home, at school, at leisure and at work. Consequently much of the material will also be encountered in other subjects, but the purpose here is to highlight the principles and to set the applications within the context of IT."

In resumé, the project, directed by Trisha Strong, has a number of key features:

1. Information Technology must be a practical activity which builds pupils' confidence to use computers.

2. Knowing about computers means knowing when and how to use computers rather than knowing the details of how they work.

3. Pupils should learn to use computers sensibly, ie by using appropriate software, to perform tasks which would otherwise be unduly tedious.

4. There is already encouraging evidence that sensible activities using computers have a positive benefit on girls' attitudes if started in primary school.

5. Information Technology can be taught either as a separate subject or as a co-ordinated part of many other subjects.

6. Teachers need training over a reasonable period of time to become confident and proficient in the use of computers.

7. Information Technology is the future revolution which has already happened.

8. IT can be taught effectively only with sufficient computers and informed and well motivated teachers.

9. Teachers can help pupils appreciate IT by using appropriate means of communication in their own lessons. "

Point 5 is emphasised earlier in the following words:

" IT is an important enough subject area to merit inclusion on the school timetable. Whether it be a separate course or as integrated modules in other subject areas is the choice of the school. However HM Inspectorate recommend that IT should be included for all first year secondary pupils at least. If IT is to become an established part of the curriculum then there is an immediate and growing need for in-service training and provision must be made for initial teacher training."

Croydon is also committed to the TVEI project.

As in most regions or LEAs, the Northern Ireland Advisory Group is considering IT and Examination Syllabuses. The views of one of its members (John Gardner, Queen's University) on the seminar discussions include the following:

"(1) IT Literacy and Teachers
Teachers were understandably recognised as the crucial ingredients in raising the levels of IT literacy. Teacher training (pre- and in-service) required more attention especially in the provision and evaluation of relatively long-term courses. The nature of such courses needed to be researched but some emphasis was placed on the need to study school and classroom based management issues and open-ended teaching strategies. The confident and natural application of IT in various curricular subjects was felt to be important for the development of IT literacy and one objective of teacher training would be to foster this usage. It was considered that only a small minority of teachers were actually aware of the potential use for IT in their subject specialisms and that this indicated a need for a study to identify subject specific applications (in addition to broader techniques such as wordprocessing).

(2) What is IT?
An underlying theme in the discussions was the need to clarify the meaning of IT Literacy. Two distinct divisions of Literacy were identified: awareness - where the objective is to increase familiarity with IT (ie removing the sense of awe or fear) and applications - where the objective is more vocational and young people gain experience in techniques (eg wordprocessing, information management) which may or may not be directly related to possible careers. An important consideration in these deliberations was the need to define the concepts and skills ie (a) technical skills which are hardware and software related and (b) personal and intellectual skills. The technical skills are readily identified as they are based on (and constrained by) current hardware and software. Personal and intellectual skills are more concept based and, therefore, are likely to persist through changing situations in hardware and software. The technology and the information explosion is causing some skills to gain a new importance eg the methods of structuring information databases now require the use of relational logic in retrieval activities. There is a need to differentiate and elucidate those concepts and skills which are uniquely linked to IT in contrast to those which are already provided for through the medium of conventional studies.

(3) Evaluating IT Techniques
There was a general feeling that the time had now come for serious evaluation of IT techniques in education and that ESRC might prove to be the vehicle for this evaluation in the absence of DES or MEP initiatives. Many issues are being raised daily by the use of IT in education yet in very few cases is its worth proven."

The Humberside LEA (Dr. I.B. Birnbaum) also addresses the issue of a separate course in IT or the integration of IT concepts into existing curricula. It appears that, at the moment, the policy is to adopt the former strategy, not that it is necessarily the better but that it is practical to implement.

The seminar members were in broad agreement that IT Literacy was an essential element in the school curriculum. How long would it be before lack of such literacy inhibited learning in other fields? Is it reasonable to draw parallels between IT literacy, numeracy and mother tongue literacy? It is known that transfer of learning, for example from mathematics to other subjects, does not take place for most children. Is the same likely to be true for IT?

Whilst much of the discussion centred around education in schools, The point was made that the Programme must also consider adult education (including parents) perhaps in collaboration with the Manpower Services Commission.

Programme actions:

The area is a difficult one in which to undertake short-term research. It would be valuable to be able to address the following questions:

(A) using an instrument, such as the Minnesota Literacy Questionnaire, do children following traditional subject curricula which have been modified to include IT concepts show better awareness and facility than those whose curriculum contains a specific IT subject?

(B) are small schools able to implement an integrated approach to IT more easily than large schools? Are the inhibiting factors, hardware, attitudes, timetabling, departmental structures?

(C) what are the conceptual structures fundamental to IT?

It is proposed to take certain IMMEDIATE actions:

(i) in conjunction with HM Inspectorate, the National Association of Advisers of Computer Education and the British Computer Society Schools Committee, to identify existing surveys into IT Literacy courses, syllabuses and case studies and, if necessary, to supplement these surveys.

(ii) to set up a project to design an instrument capable of assessing IT Literacy (as drawn from work in (i)), perhaps based on the Minnesota model. Professor D.C. Johnson (ex-Minnesota) should be involved in this.

(iii) to explore ways of supporting further projects:

(a) with the DES to undertake research into questions A and B using the tool developed in (ii). This would involve work in large and small secondary schools including a number prepared to modify existing

curriculum in years 1 and 2. The activities in the feeder primary schools would also be an important factor for the study.

(b) with Manpower Services Commission (Open Tech and TVEI Unit) to reanalyse the concepts central to IT Literacy (as they are implied from (i) above) from a vocational and non-vocational standpoint.

(c) with ESRC to undertake fundamental research, of the kind carried out by the CSMS project, in order to be able to establish a cornerstone from which IT Literacy can be defended as a series of central core concepts. [Currently, the teaching of IT is like the teaching of reading rather than literacy]

SEMINAR 2: IMPLANTING INNOVATION AND TEACHER EDUCATION

The questions posed to attendees at the seminar were:

- Why is innovation hard to sustain?
- What pattern of teacher education can aid the process?
- What factors influence the establishment of innovation?

As might be expected, some time was spent in discussion about what changes were needed/anticipated in education as a result of the availability and adoption of IT. Before the questions could be answered, it was necessary to look ahead to CAL and other IT activities in the next decade. The ignorance and uncertainty about the role of the techniques of artificial intelligence must be freely admitted. There was a clear need for conversations between AI researchers, CAL developers and Educators and Psychologists

The barriers to change appeared to include:

- examination constraints;
- pressure on teachers;
- access to facilities;
- scarcity of informed teachers and heads;
- lack of technician support.

It is necessary to understand why some resources (text books, blackboards, projectors etc) are successful. Is it their simplicity, availability, cheapness? Which studies of other forms of innovation and their uptake can be appllied to the IT field?

A major factor which limits the rate of change is the inherent potential of IT use to be more exciting (and effective?) in its learner-centred application. This demands changes in the role of the teacher. It is also necessary for teachers to be able to discover ways of integrating the software into classroom and laboratory activities. There is a great need to build up teacher's confidence in adopting a new and less 'secure' role and in

the skills of handling learner-centred materials. Part of this is confidence in handling the hardware but the personal obstacles to change are more difficult to overcome.

It is no longer the case that there is insufficient material. Much of what is available is of poor quality but the definition of 'poor' requires care. Many pieces of software, in the right hands and at the right time, can stimulate learning. The key factor affecting valuable uses of IT based materials lies in the teachers perception of how learning by particular groups of pupils can be enhanced.

A factor rarely considered is the personal relationship between teacher and class as a whole and between teacher and individual members of the class. Open-ended and exploratory materials are likely to be most successful when the relationships are built on respect, confidence and freedom. Didactic material could be successful in a rather more formal setting. It is likely that the teacher-class relationship will vary from class to class with which a particular teacher is concerned. Hence, it may be concluded that there is no such thing as good material or bad material (unless it's content is wrong); it is the context in which it is used which is the deciding factor.

Many of the preceding issues relate to teacher education. For the reasons stated in the report on the IT Literacy seminar, short-term impact can only be achieved by an emphasis on in-service courses. A number of questions can be raised:

- is there evidence to support the various models of in-service courses?
- to what extent are teachers who have been on substantial courses (over 200 hours) able to put into practice the knowledge and skills they have acquired?
- how effective is in-school training?
- how can head teachers and advisers enhance the newly retrained teacher's potential?
- what post-course support is necessary?
- how can initial teacher education courses be changed to take on IT concepts and uses?
- to what extent is/should CAL itself be used in the teacher education process as a medium in its own right? [The 'do what I say, "Use IT", rather than what I do' syndrome]

Prior to any new research in this field, a detailed review and analysis must be made of direct and tangential studies already carried out or underway. The DES, with some MEP actions, has undertaken small investigations into INSET and materials to support courses and school innovation. The studies following the Nuffield Science projects concerning diffusion of innovation may be relevant. Is the diffusion of IT uses and methodologies in some way fundamentally different?

Priorities for exploratory surveys and possible research studies include:

- teacher education models;
- key agents in bringing about change;
- teacher acceptance of new classroom role;
- case studies of good practice both in INSET and classroom use of IT.

In these studies which concern innovations, it is important to monitor management decision-making. It may also be important to speculate on certain education scenarios for the future and to undertake contingency research for possible change. The current Computer Board/U.G.C. initiative in installing undergraduate workstations for teaching purposes is an important project in which to monitor change and its effectiveness.

SEMINAR 3 : ARTIFICIAL INTELLIGENCE AND CAL DEVELOPMENT

The questions posed to members were:

- In the short term, can CAL materials be improved in their learning potential if some techniques of AI are incorporated?
- Is this a rational 'next stage' for CAL?
- Is an intelligent 'front-end' a small step in the right direction?
- Can we benefit from an intelligent authoring language?

Again the discussion commenced by consideration of a range of general issues. Many of the issues raised are summarised in a summary paper prepared by Bob Hart (Chiltern Region, MEP)

"1. THE MEANING OF CAL

The popular image of CAL is of a movement which was rooted in narrow didactic models of teaching and learning. It has, unfortunately, become associated with programmed learning, electronic textbooks and the electronic blackboard.
It should be renamed COMPUTER ENHANCED LEARNING or, failing that, be redefined in the Journal of Computer Assisted Learning, to embrace the following concepts:

2. THE CHILD AS A LEARNER

Computers should be used to FACILITATE, to ENABLE the child to transcend his/her physical and computational limits- the PHYSICAL HANDICAPS OF CHILDHOOD, and old technologies.
Projects should be supported which aim to develop.....
SUPPORTED CREATIVITY
LATERAL THINKING
INVESTIGATIVE LEARNING
EXPERIMENTATION
GUIDED DISCOVERY
EXPLORATION
COMMUNICATION SKILLS

3. METACURRICULAR COMPUTING

The traditional secondary school subject structure has constrained the thinking of children and teachers alike and has been a bar to radical curriculum developments.
We should encourage work in developing applications which transcend the traditional curriculum barriers.
These metacurricular applications include:
DATA MANIPULATION
WORD PROCESSING
INTERACTIVE LITERATURE
(PLAYING and WRITING ADVENTURES and SIMULATIONS)
LANGUAGES - LOGO, Prolog
IDEAS PROCESSING

4. CREATIVE MEDIA

CREATIVITY is an essential element in the emotional and intellectual health of our children, which has been threatened by political, sociological and economic changes in our society.
Particular consideration should be given to applications which encourage or facilitate creative work in:
INTERACTIVE LITERATURE
MUSIC PROCESSING
ELECTRONIC ART and IMAGE PROCESSING

5. SUPPORTING THE TEACHER

TEACHERS are suffering from FUTURE SHOCK. The challenge of rapid change can be stimulating, but also very threatening. This is perhaps exacerbated by the ageing of the profession. We are older dogs who will have to learn new tricks.
We would serve our profession badly by allowing teachers to bury their heads in the sand, or to imagine that nothing will really change. It is only delaying the crisis if we feed our teachers with electronic pap, the greatest quality of which is that it fits snugly into the traditional curriculum. We have already been judged guilty of introducing a major breakthrough in learning technology with trivial examples. We should not attempt to give teachers security by trying to arrest or disguise change.
A better way to support teachers is to give the children computer activities that have intrinsic motivation, built-in success, encourage fruitful communication, thinking, cooperation, puzzling, creative arts, writing and other learning activities away from the computer.
Activities should be addressed directly to the child, and not necessarily require adult presentation, mediation or translation.
We now have the opportunity to disseminate learning environments.
So, we should be supporting teachers by directly motivating children and supporting their curiosity and creativity.

6. WHAT CAL CAN LEARN FROM AI

FLEXIBLE INTERACTION STRUCTURE: Children do not think in dendritic structures, nor in procedures, nor in Command Standard - their thinking is a miasma of deduction, intuition, estimation, prediction, guesswork, inspiration, association. Program design could allow children to break out of the straitjackets of arbitary structures.
INTELLIGENT INPUT: Natural language interpreter.
INTELLIGENT HELP: The right level and content at the right time.
SUPERVISOR: Files which record children's responses and "errors" to inform the future refinement of the material.
INTERACTION PATH LEARNING: Strings of commands can be processed into invididually habitual procedures, and new primitives evolve.
EXTERNALISATION OF CONDITIONALS and RELATIONSHIPS BETWEEN ELEMENTS: These could be held outside the operational code (as DATA is currently), allowing adaptation by user and author.
CREATION OF MICROWORLDS to explore.
RESIDENT EXPERTS: Wordprocessor with DICTIONARY, THEOSAURUS

7. THE ROLE OF RESEARCH

RESEARCH AND DEVELOPMENT should not be separate. Development, application, and evaluation should be concurrent. Research on existing materials may take 2 or 3 years to reach useful fruition, by which time the material or even the activity may well have been superceded by new concepts, and the findings would then be of limited use.
PIONEERING: Research should not be chasing to keep up with the rate of innovation, but rather pioneering new fields, ahead of current practice, thinking, easily available technology, and enlightening their application when they become popular."

Other points discussed are reflected in parts of a similar summary paper by Tony Scott (Croydon, TVEI)

" As schools develop 16-bit networks we can begin to think about using AI techniques for delivery systems. It may also be possible to develop techniques of using authoring packages so that they are immediately accessible to the teacher in the classroom.

The classroom can become truly a window on the world, with access to large, real, remote databases on practically everything, and with the provision of interactive of interactive video facilities in the classroom.

At the same time, the home environment may be becoming equally resource-rich and learner-supportive. How do we match this provision? .....

Information Technology is perhaps most help in the teaching of other areas of the curriculum, e.g. History. Perhaps it is useful to think of what resources or environments we would need in terms of the ideal History or French or Home Economics classroom, and what IT support they should have.

How can we use IT to help with the general run of curriculum support? How about all the Music Advisers having mailboxes on the Times Network, rather than the Computer Education advisers?

To what extent can we put decision making about the content of IT based teaching materials in the hands of the classroom teacher who knows the kids in front of him/her? .....

Can we make recurrent education a reality for the teaching profession? One model which might provide a basis for this is the use of the Certificate for Vocational Preparation Tutors as a curriculum and staff development tool. Although designed originally for staff who would be involved in CPVE teaching, this profile certificate provides a vehicle for identifying teachers' existing competancies in using 'a practical curriculum' approach, and a mechanism for enhancing them.

Part of the assessment process can be working with the teacher in the classroom. So the Certificate can be linked to curriculum development materials of various kinds and, as well as proving materials in classroom trials, trainers are also able to provide support to the teacher in his/her attempts to use such techniques as negotiated learning contracts or interactive profiling. Research is needed to examine whether such an approach might lead to a better and more permanent take-up of ideas in the school than by conventional attendance at traditional courses."

Whilst electronic means of communication have their roles,

"....Networks of interlocking personal contacts and relationships are more effective and productive then any electronic transmission system - the current series of ESRD/ITE seminars being a case in point. The idea of establishing a community of research assistants who are attached both to particular research initiatives and obliged to attend regular cross-fertilisation meetings bears further investigation."

Looking at possible strategies for action:

"A week-long conference in Summer 1985 bringing together AI researchers and computer education practitioners would seem to be a minimum - at least if those of us in the computer education community are to begin to understand the language of the AI field. A continuing series of seminars, perhaps hosted alternatively by the two communities, would be of value.

> At least some of these seminars should take the format of specification/ design/ development workshops. We could probably learn from the experience of the Alvey Project in the organisation of such seminars and the setting up of 'demonstrator' projects."

And a final point on teacher education:

> " ... is the emphasis on the in-service training of individual teachers counter-productive to effective organisational innovation, as the emphasis is so much on staff rather than schools?"

In the general discussion on IT in education, a significant and innovative set of themes for a 20 hour in-service course (yes, for history teachers) was tabled by John Nicol (Exeter):

> History Teaching and Computing
> Information Retrieval : detective work
> Workshop : writing databases for exploration
> Information Retrieval : Quest/micro-query
> Workshop : producing a data file
> Information Retrieval : place names
> Information Retrieval : viewdata, teletext and videodisc
> Simulations
> Hands on session : simulations
> Writing simulations
> Workshop : writing simulations
> Adventure Games
> Workshop : adventure games
> Expert systems
> Reference Retrieval
> Word Processing
> Software assessment
> Course menber software demonstrations
> Overview of CAL : present and future

The discussion began to focus on the main theme of the seminar after strong emphasis on priority consideration of learners and their engagement in active learning experiences and creativity.

It became clear that a significant gulf existed between the AI and the Education communities; even the terminology required translation. AI research could be considered as directed towards two principle models:

- strong AI research was directed towards electronic replication of the mechanisms of the brain;
- weak AI research was concerned with functional representations of human cognition.

The major applications of AI techniques to date were concerned with hard science, for example, in the aerospace, robotics and military spheres.

The seminar attendees agreed on the need for the establishment of a forum in order that the AI and CAL research and development teams could find suitable ground for collaborative research and development. [Note the point

made earlier that R&D should be supported concurrently by the Programme.] It was agreed that an inquiry be initiated in the field; the text of a notice to initiate this inquiry is contained in Appendix B.

In this field immediate actions for the Programme are to be directed towards creating an exchange of expertise between the two communities previously identified. This axis for this work pivots around Edinburgh (Paul Brna and colleagues) and Exeter (Masoud Yazdani) passing through Lancaster, Leeds and on to the OU and Sussex (Self, Hartley, Eisenstadt and du Boulay). The Programme will build on an existing AI and Education forum which is holding a conference in September 1985.

[The AI and CAL seminar benefitted from its attachment to an already organised workshop of the major CAL development teams managed this year by the ITMA Project in Plymouth.]

GENERAL POINTS ARISING FROM THE SEMINARS.

A number of possible strategies to be followed by the Programme were discussed. At all the seminars, there was overall support for a strategy which included:

- a facilitating role for the Programme;
- the exploitation of appropriate technology to bring the community and its work closer together;
- the establishment of an infra-structure for major research through studentship placements in large and small research and development teams from all parts and the UK.

FURTHER FOCI FOR RESEARCH AND DEVELOPMENT.

During the se s, other themes requiring study were spoken of dire or indirectly. Two of these stand out:

- problem solving;
- learner-machine interface.

The latter may be seen at part of the AI area but other 'non-intelligent' aspects should also be studied. These include the effective resprentation of data through appropriate screen design and learner control of interaction.

Problem solving has been studied in some detail in recent years, in particular, in respect of the uses of LOGO. This work is but the tip of the iceberg and, with the imminent arrival of much more powerful systems, further studies which involve the design of new software tools for problem solving at all levels of learning must be seen as a priority for the Programme. The potential to create exciting and challenging windows on the world for learners requires a joint research and development startegy for the Programme.

ACKNOWLEDGEMENTS

At a time when the Programme had no staff, various institutions and personnel were depended upon to undertake local arrangements for the seminars. I would like to achknowledge the importance of the assistance given by:

Rosemary Fraser and Heather Brown at ITMA and the College of St. Mark and St. John in Plymouth;
Brenda Briggs and colleagues in the School of Education in Southampton;
Derek Esterson and the staff at Avery Hill College in London.

Not all those who contributed to the discusions are mentioned in the report. All those listed in Appendix A, the attendees at the seminars, made invaluable contributions. I am particularly grateful to Donovan Tagg for his copious notes taken during all the seminars and to those who wrote with their reflections after the event.

APPENDIX A List of Attendees

Information Technology Literacy - Avery Hill

M. Lancaster,	Open Tech
G. Goldstein,	HMI
W. Tagg,	AUCBE, Hatfield
J. Sanger,	CARE, University of East Anglia
K. Ruthven,	University of Cambridge
J. Gardner,	Queen's University, Belfast
E.D. Tagg,	Lancaster
R. Lewis,	ESRC/Lancaster

Implantation of Innovation and Teacher Training - Southampton

M. Aston,	AUCBE/MEP, Hatfield
P. Barker,	Moray House College, Edinburgh
N.C. Brown,	IBM, Portsmouth
B.I. Briggs,	University of Southampton
G.T..Fox,	CARE, University of East Anglia
D. Hopkins,	West Glamorgan Inst. of H.E.
P.J. Kelly,	Univ. of Southampton
A. Kent,	Inst. of Education, London
M. Meredith,	Univ. of Southampton
J. Nicol,	Univ. of Exeter
M. Sage,	Univ. of Southampton
A.P. Scott,	Croydon, LEA
E.D. Tagg	Lancaster
R. Lewis	ESRC/Lancaster

Artificial Intelligence and CAL Development - Plymouth

P. Brna,	University of Edinburgh
A.P. Scott,	Croydon LEA
R. Hart,	AUCBE, Hatfield
M. Sage,	Univ. of Southampton
J. Nicol,	Univ. of Exeter
R. Hartley,	Univ. of Leeds
J. Coupland,	ITMA, Plymouth
E.D. Tagg	Lancaster
M. Cox	Chelsea College, London
R. Millwood,	Chelsea College, London
D. Riley,	Chelsea College, London
H. Burkhardt,	Shell Centre, Nottingham
R. Phillips,	Shell Centre, Nottingham
D. Esterson,	ILEA
N.C. Brown,	IBM
R. Lewis,	ESRC/Lancaster

Appendix B ITE/2/85

"The Programme aims to promote the applications of Artificial Intelligence in the field of education. In particular, it is hoped that appropriate AI methodologies can be used in the next generation of educational software. An inquiry is being made of those engaged both in the AI field and in the development of computer tools to promote learning including CAL.

The Programme is keen to see research being carried out on appropriate AI systems such as:

- logic programming for modelling by students;
- the ability for students to explore existing models of working systems;
- pattern recognition;
- knowledge representation;
- CAL incorporating facilities for reasoned explanation.

In considering desirable learning activities, opportunities provided by IT should support pupil centred learning and creativity. Human communication between learners and between learners and teachers is an essential element of such learning activities. This carries implications for the role of teachers.

Information about successful research and development which might have applications in Education is sought from the AI community. The papers should reflect present day systems and contain Appendices describing such systems. In some cases, where the detailed descriptions relate to only one element of the total system, it should be made clear what other elements would be needed and a blue-print of how the would be synthesised.

It is important that the data collected reflects adequately the needs of educational development teams and the experience of those using systems in research into Artificial Intelligence.

The purpose of this inquiry is to assist in assembling a nationwide state-of-the-art report on AI and its application and potential in education. This report will help in formulating a policy towards funding a series of demonstrator projects which build upon existing CAL and AI experience."