Implementing the technology curriculum in higher education

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The main focus of attention in implementing Technology in the National Curriculum has been on the needs of INSET but with schools on the brink of introducing Attainment Targets and Programmes of Study for Key Stages 1-3 in September 1990 — what of the needs of intending teachers? Schools taking on probationary teachers will expect them to be prepared adequately, but will they? Roehampton Institute will be sending out 350+ into the profession, mainly to primary schools, each of whom will have received a 2-day block course as a short term strategy. Other short inputs are proposed for students on licensed/articled teacher programmes. HMI invited Higher Education colleagues to a conference at Wolverhampton Polytechnic in January to discuss this very theme. Many institutions are at an early stage of making contingency plans. With Technology becoming a feature of a professional studies curriculum for intending primary teachers, are HE institutions adequately resourced with qualified staff to prepare them? How will specialist and curriculum co-ordinators be trained, not just for secondary but primary level? Will space and equipment resources be adequate for the numbers of students now taking this subject? Who will be responsible in the institution for timetabling and devising a relevant programme of study for all the students? Will decisions be taken by educationalists or specialist departments? An National Curriculum Council directive on training for the National Curriculum (Oct 1988) suggested that HE institutions and LEAs work more closely in preparing new teachers to meet the requirements of the Technology curriculum, but can they work co-operatively or will they view each other as competitors for the INSET market? This article discusses some of these issues and outlines how the challenge of the long term strategy of Initial Teacher Training is being met in one Institution of Higher Education.

A need for change

For those readers not familiar with Roehampton Institute, it is affiliated to the University of Surrey and has four constituent colleges with a total of 2,800 students. There are four Faculties, the largest of which is the School of Education with 72 full time staff out of 221 teaching staff in the Institute and over 50% of the students. As all the colleges were originally female foundations, there is no flourishing CDT or D and T departments. A strength has been the Home Economics department (now called Technology and Consumer Sciences) and, until their demise in the late 1970s, the craft traditions. The problem of slotting Design (let alone Technology) into the mainstream curriculum has been a personal vexation for over a decade. Krysia Brochocka, a former colleagues, made a valiant effort to introduce Design as a B Ed/BA Combined Honours option and resorted to developing an inspiring and successful model for Design within Home Economics. She moved on to give her expertise to the Parkes Committee. National developments have helped by giving status to Technology in the National Curriculum. Government legislation is a powerful influence in developing change; by April 1988 the School of Education was addressing Design and Technology in Education. If the Institute had had a D and T/CDT department, responsibility may have been assumed by them for the Technology Curriculum (Home Economics was more orientated towards management and had shifted away from education).

The question of responsibility at institutional level

At this time, a new management structure was emerging in the School of Education (see Figure 1) which facilitated the development of the Technology curriculum. The School of Education was attracting curriculum specialists from all the curriculum areas into the Faculty of Education structure. This has been a significant characteristic in implementing change in an area which is both a subject of study and cross curricular. In similar teacher training institutions, any of the five contributing areas may take responsibility for Technology, but a co-ordinated approach is needed for both secondary and primary levels, and what influence do specialists have over education? Specialists departments tend to be in different Faculties, eg at Roehampton, Technology and Consumer Sciences is in the Faculty of Science, Mathematics and Computing; Art is in Arts and Humanities; Business Studies in

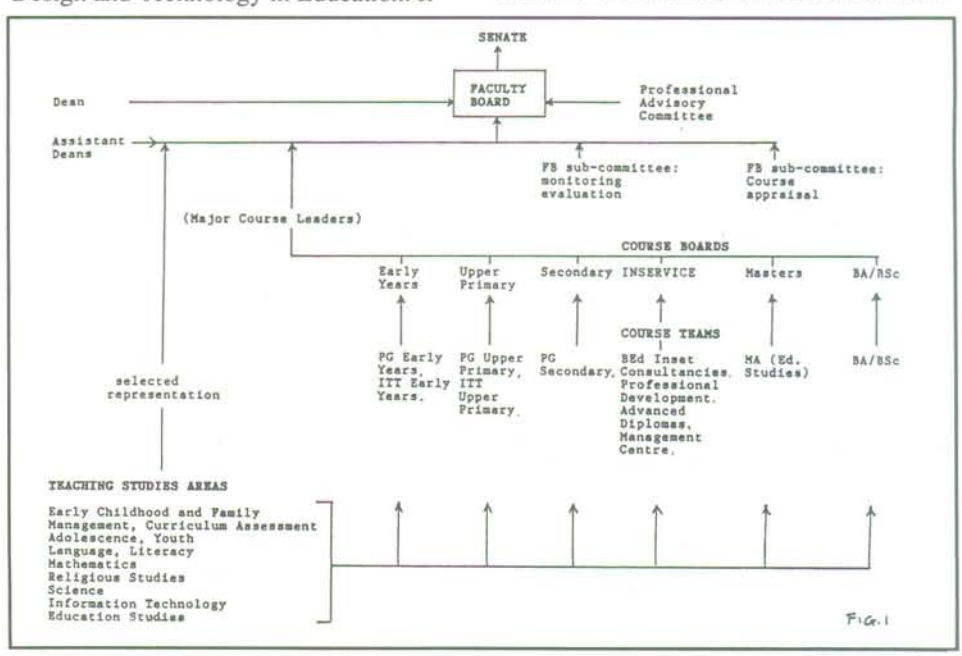


Fig. 1

Social Sciences. The newly defined National Curriculum approach to developing Design and Technology as a 'unitary concept' crosses the boundaries of the Arts and the Sciences. There is no group of specialists in HE who are Design and Technology specialists of the model perceived by the NCC Working Group. The new generation have yet to be trained.

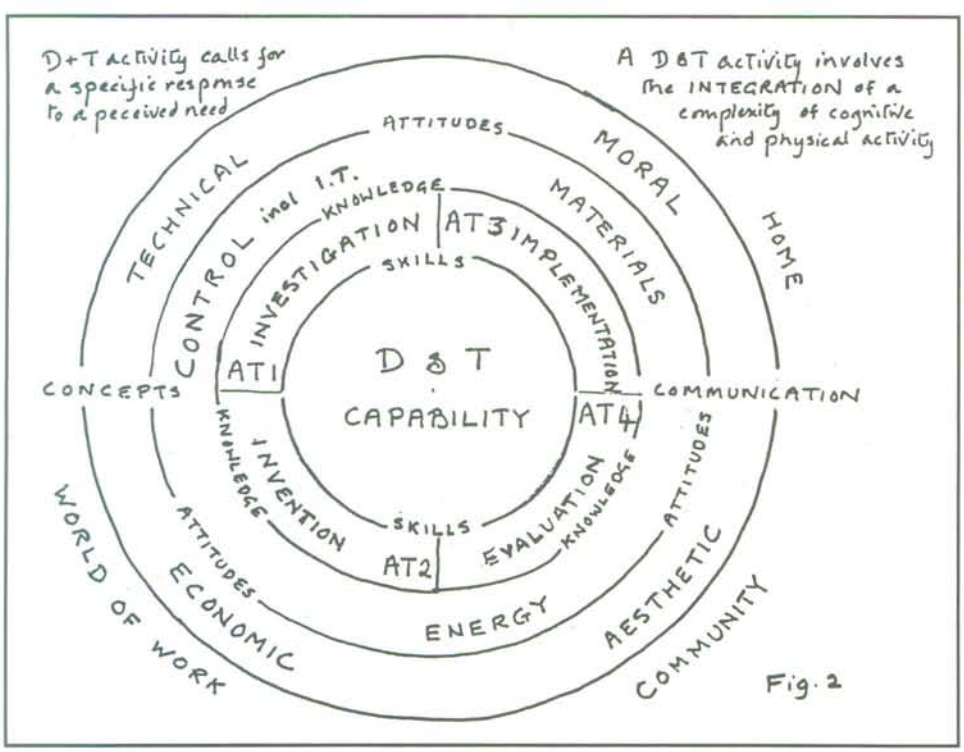
A working party is established

Having identified the need to develop the curriculum inside the School of Education, we sought expert advice from Ken Baynes and Krysia Brochoca of Triangle Projects to map out a plan for implementing change. With their help we set up a Working Party as a consultative group of the School of Education Faculty Board. Colleagues representing diverse specialisms within the School of Education were invited to join. The group started with ten members and included Art/Design, Information Technology, Home Economics, Business Studies, Environmental Studies, and the core areas of Science, Mathematics and Language, as well as colleagues from another Faculty, ie Technology and Consumer Sciences. A forum of debate was established just before the Interim Report. The group proceeded to monitor national developments, raise awareness in the Institute and hold a conference for 200 teachers. In response to ERA, the management structure of the S o E had identified Science and Technology and Information Technology as Teaching Study Areas. Quite early on we were embroiled in the Science versus Technology and Design versus Technology debate. The unique nature of Design and Technology and why it had its own bodies of knowledge outside these identified areas was the issue which needed to be addressed at that time.

By Summer Term 1989, the School of Education needed to know what training both specialists and generalists would require to meet its responsibility to the Council for the Accreditation of Teacher Education in undergraduate teacher training. It resolved that it would seek ultimate responsibility to Faculty Board and Senate for the whole of courses leading to qualified teacher status and not just for Education and Professional Studies. This was to ensure that students developed a sound conceptual framework on which to build knowledge and skills. It was therefore proposed that all students taking BA (with qualified teacher status) should take two subjects of study as well as professional studies, and that one subject should be a core subject and the other a foundation area. This opens the way to the possibility of offering a subject specialism in Design and Technology Education. By far the major proportion of student teachers at Roehampton are destined for the primary sector and this level has been identified by the Working Party as an initial priority area for the development of the Technology curriculum. It is envisaged that students intending to become curriculum leaders in the Technology curriculum will need to study the subject specialism in depth and at their level in order that they may acquire a satisfactory grasp of the principles of Design and Technology Education. As all students intending to teach in primary schools will be required to teach the Technology curriculum, the Educational and Professional Studies programme also has to ensure that all students have a suitable philosophical, practical and pedagogical curriculum framework in which to operate.

Design and Technology capability — student level

What knowledge, concepts, skills and values will students need to acquire in order to receive an adequate Design and Technology Education? These requisites are embodied in the ATs and POS of the NC proposals for Technology (Figure 2). The two profile components of Design and Technology Capability and Information Technology Capability are equally applicable to students. This involves the development of ability to control and shape the natural environment by personal intervention in developing a more comprehensive understanding of the moral, economic, physical, social, cultural and political aspects which inform the activity, thus improving and enriching the quality of life. One of the problems with ITT students is that few of the first year intake have any experience of D and T subjects in school, and in general, students on BA(QTS) and PGCE courses tend to come predominantly from Arts and Humanities and Social Studies backgrounds. This will change as the NC percolates through the system. At what level should a student commence? Students will be required to bring together their own experience, skills, knowledge and understanding, imagination and judgement, and apply them to the executing of specific tasks. Students need a general, broad D and T knowledge, particularly of the concept of a process activity, and an in depth knowledge of one/two forms of control, source of energy, materials, components and tools. They do not need to know about everything but they do need to know what to find out, what form other knowledge should take and what depth of knowledge for a particular purpose. They also need a thorough understanding of the NC requirements for the area and the pedagogical implications of the Technology curriculum.



Essential elements of the professional studies content a cross 4 years and the basis for specific D and T input have been identified as follows:-

1. **Human Intelligence.** The development of full human capability. Mental Processes — Imaging and Modelling, in particular Designerly Thinking.
2. **Child Development.** How children learn about the physical world. How children interact with the environment. How children change the environment.
3. **Communications Skills.** Learning to communicate other than by words. Graphical skills — 2 and 3 D thinking. Information Technology.
4. **A Foundation of Design and Technology Experience.**
   a) Design Procedures and Methods;
   Design and Technology in the Outer World;
   Design and Technology in the Curriculum;
   Activity based practical — open ended projects where students learn through their own efforts (and failures).
   b) **Specific Technologies.**
   Materials;
   Tools;
   Processes.
   c) **Design and Technology Education.**
   The National Curriculum;
   Assessment;
   Teaching styles and study methods reflected in schools;
   Learning across the curriculum.
   Common activity with core areas.

Includes Information Technology permeating through the programme. Students need to experience a variety of modes of study and student assessment should be in a form suited to the area. It can be difficult to wean validating bodies away from 2,000 — 6,000 words essays. The Working Party has identified a specific Design and Technology element for all students. Bargaining for time and staff, etc is another problem. At primary level Design and Technology is likely to be integrated into topic, project and theme work and this is the most appropriate approach. Students also need curriculum studies opportunities to explore these methods; at Roehampton, they can do this effectively in 'School on Site', where whole classes come to work in the base for several days. However, a holistic approach cannot be developed without a full understanding of the concept of Design and Technology. There needs to be a specific input as well as a greater understanding between D and T and the other areas of the curriculum, eg, identification of forms of representation across mathematics, science, language and art. Students and staff need to be aware of D and T elements in all areas of the curriculum. There is a temptation to accept D and T activity carried out in eg Art/Design or Science/Technology as adequate because students have, for example, engaged in practical problem solving activity. What is the point of duplication? These approaches have other aims and are only a part of the D and T spectrum; however it is important to monitor these experiences because they contribute to the students' ability in D and T activity.

The nature of a technology curriculum

It should not be necessary in a specialist journal to give a detailed description of the Nature of Design and Technology. However, it may be helpful to clarify our approach to Design and Technology in Education in the framework of the

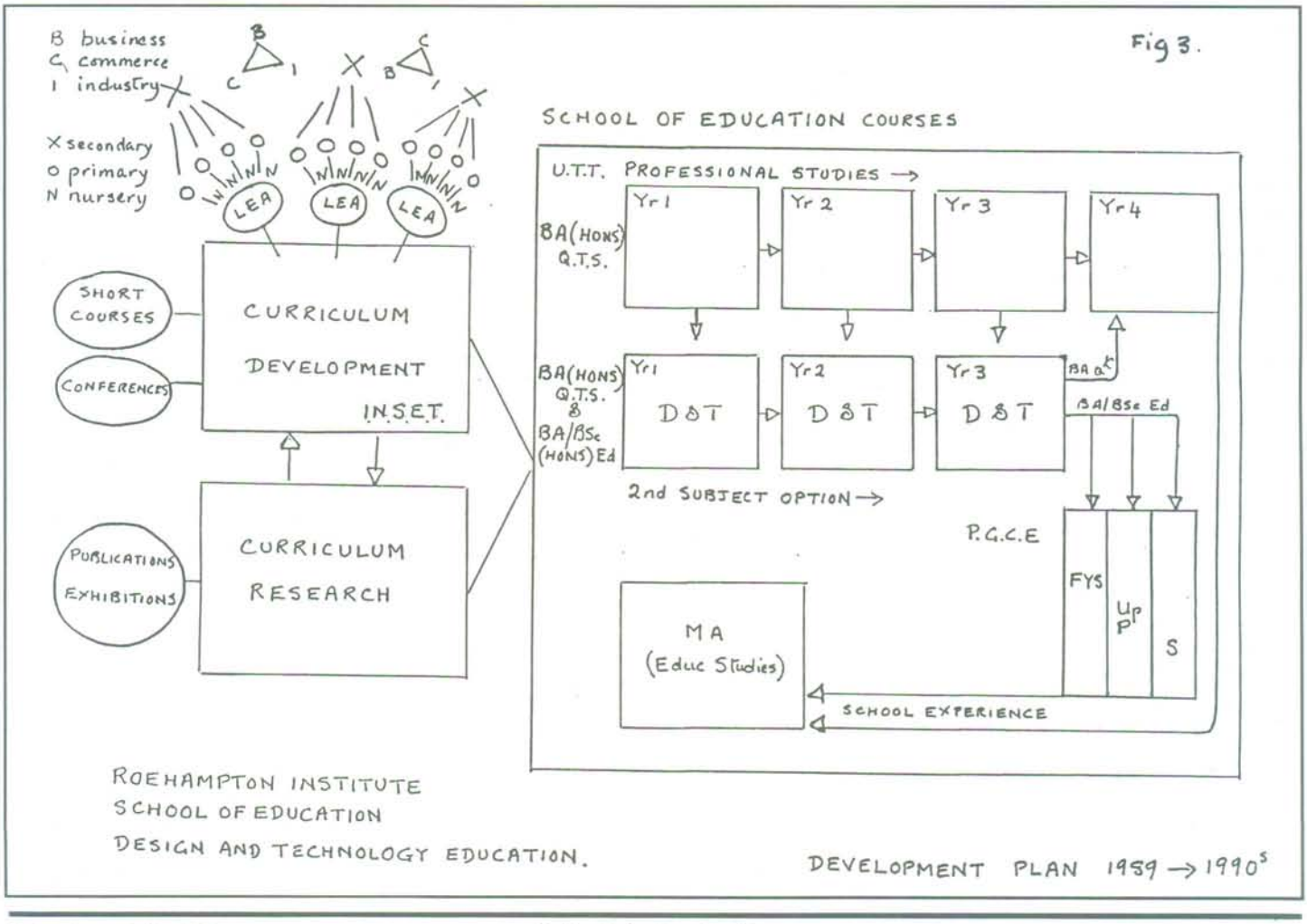
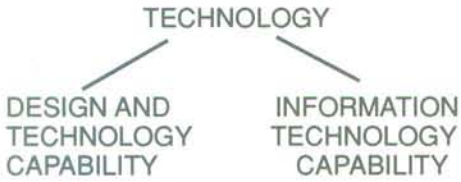


Fig 3.

Technology curriculum as defined by the NCC which comprises two strands:-



D and T Capability is a newly defined approach to the curriculum, whereby Design and Technology are to be considered as a 'unitary concept'. IT has an important role in the development of D and T Capability, but IT Capability is also expected to permeate through the whole curriculum. In terms of education, 'Design' and 'Technology' are subjects of study in their own right, ie each has its own body of knowledge. 'Design' is concerned with cognitive modelling processes, particularly with 'imaging and modelling' and 'Technology' with the enormous range of means by which human beings can make desired changes to their physical world. Both areas in the NC unified model are about human beings and how they are able to relate to, adapt and change the physical world of artifacts, systems and environments. The unique feature of Design and Technology in education is that it fosters our ability to speculate and make changes in the future which affect us personally in a way that no other area of the curriculum does. In fact, contemplating these changes in the curriculum at Higher Education is a design task. There is an identified need, a desired change and an identifiable outcome.

The way children learn and understand through doing and making has been long established in activity and project based curricula. The NC Working Group recognised the important contribution that Design and Technology can bring to the curriculum. The Government has shown more interest in a second strand which brought learning by doing and making into education, that is, the potential value to contributing to economic growth and vocational skills. The essential aspects which concern children's learning are shrouded in the title Technology. Therefore it is important that educationalists know what this area is about and translate a sound philosophical understanding to future teachers.

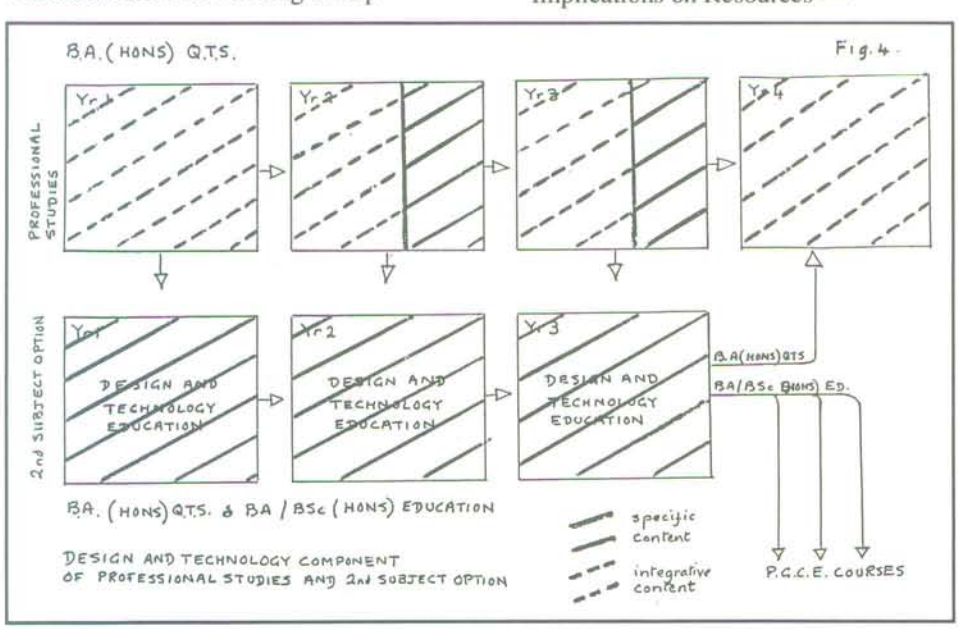
The Roehampton institute model

A major task has been to outline a programme for the development of Design and Technology Education in the Initial Teacher Training courses at Roehampton from 1989/90 — 1993/4. This model was devised during the summer vacation 1989, again we took consultative advice from Triangle Projects. It was accepted in principle by Faculty Board in October 1989. It was a complex task which needed to consider the following courses:-

BA (Hons) QTS (Primary) 4 years
Professional Studies
PGCE(Primary) 1 year course
PGCE (Secondary) 1 year course
D and T 2nd subject option 3 years for BA (Hons) QTS and BA/BSc (Hons) Ed (from 1991)
Short term input for all ITT students leaving 1990
As a modular credit system is to be introduced, this also had to be considered.

Plus:-

INSET development
Staff development
Implications on Resources —
Space/Equipment/Materials
Timetable
and most important, Staff
(see Figures 3, 4, and 5).



From the onset of the project, it was agreed that a substantial staff development course should be built into the planning period.

Unfortunately, there were insufficient funds to mount a course of the required level. To raise sufficient funds we would have had to mount INSET during this time. A policy decision was taken, that with the curriculum under discussion by the NCC Working Group, our intervention in INSET could bring more confusion to teachers and that we should wait until ATs and POS had been decided.

The main obstacles to progress in implementing change are **Resources — Space/Equipment/Materials, Time and Staff,** and the inevitable problem of finance in this equation.

Space. It was agreed that primary bases would be the favoured location for practical activity. It students can work effectively there, then it can be done in the primary classroom. Science, Maths and Art all have bases which can at times be used for specialist equipment we should seek co-operation outside the Faculty with Technology and Consumer Sciences. This would be used for ½ subject degree courses, secondary level PGCE, MA and INSET work. However, there is very hard bargaining to be done as each Faculty and departments within move towards a self financing situation. In general, with the shift to diversification in HE in the late '70s, Education departments have become impoverished of resources.

Time. The allocation of time in our proposals was planned to fit into the original 100 hours that Technology was to share with Science (CATE). This would have given a substantial time in the second year to develop the theme Modes of Communication and Mental Processes which could have integrated with the core curriculum. It will now have a time allocation on a par with other foundation areas. Negotiations have to be taken with course leaders and their Course Boards to make sure students have adequate quality time.

Staff. By far the most important resource and a major obstacle at present. On the positive side, we have a co-ordinated team with a co-ordinator, and an empathy for the curriculum area which is essential to manage change. The problem is that we have insufficient core staff to run all

the proposed courses, not just ITT courses but MA (Ed Studies) — also a part of the proposals. Many of the group have responsibilities to other areas of the curriculum or are the responsibility of another Faculty. How can the situation be resolved? Sharing work with LEA advisers may be one solution. In the climate of PCFC, few new appointments are being made by the institute. However, on a further positive note, the Working Party became a Teaching Studies Area in February 1990, bringing it into the management structure of the Faculty. There is also an Information Technology TSA. Each area has much to do individually, but there is cross membership. The management of the School of Education has been supportive throughout (despite the lack of funds) and therefore Roehampton has the institutional condition necessary to proceed.

The role of higher education in INSET development

In terms of INSET, we have a dual role, first to foster teachers' professional development by providing a framework and credit system, and secondly to inform our ITT courses through promotion of curriculum research (Figure 6). Our main responsibility is to ITT. We need to build our courses on the best practice. LEAs have a vested interest because it is their responsibility to see that teachers are adequately prepared to deliver the curriculum. There is very little research being developed, a shortage of funds and much to be done. The whole curriculum is based upon propositions about how children learn, therefore we need, for example, (a) to make systematic observation of pupils in the classroom, observation which enable formative descriptions of patterns of children's learning; (b) to record children's achievement in order to evaluate the effectiveness of teaching and learning methods and curricula.

In order to develop a strategy for Curriculum Research and Development, the TSA convened a meeting with advisers and inspectors in constituent LEAs to look at a way forward in developing a co-operative relationship. It has been proposed to set up an advisory* group of external representatives as a consultative group to the TSA. It is hoped

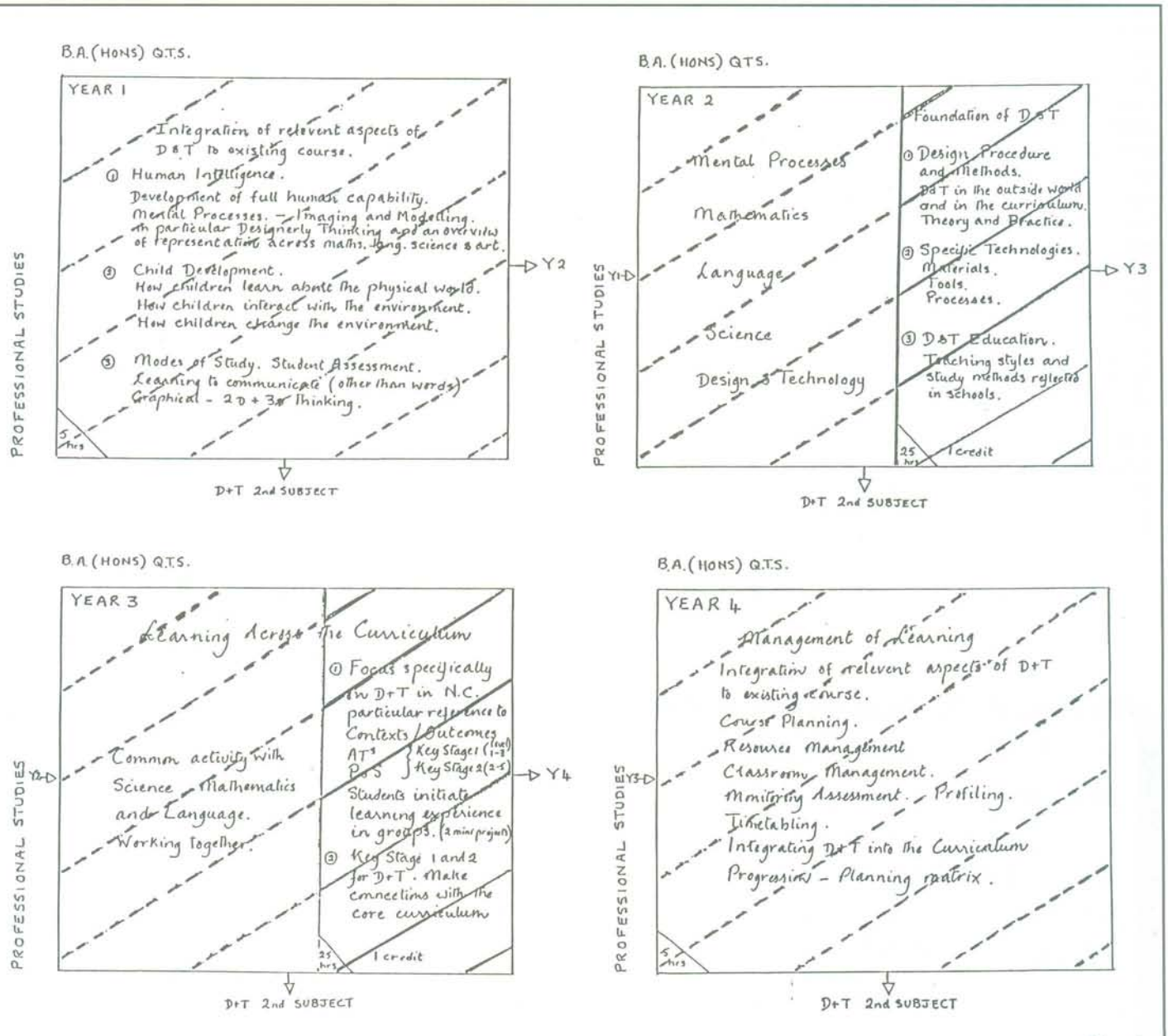


Fig.5.

that this venture will be of mutual benefit to both parties and that a co-ordinated INSET programme can be developed. At present, income generation demands INSET work to supplement Institute income, but it so often results in frantic and unco-ordinated schemes which do not inform the mainstream teacher education courses.

In December 1989 the Education Secretary, John MacGregor, announced that LEAs propose to spend about £325m on in-service training for teachers in 1990/91. The amount of LEA expenditure eligible for grant support under the LEA Training Grant scheme is to be about £215m. Some of this will go to developing Technology INSET, and this is important to give teachers confidence and support in attempting to implement the curriculum in schools. But it is extremely short term, and teachers given a limited course frequently end up with pedagogues of half understood facts and concepts. For a long term strategy a greater commitment needs to be directed to Higher Education with priority given to the undergraduate teacher training student. Only when a fundamental foundation is laid in terms of a philosophical and pedagogical curriculum framework at HE level can the Technology curriculum be fully implemented.

* An advisory group to the Design & Technology TSA was established in March 1990.

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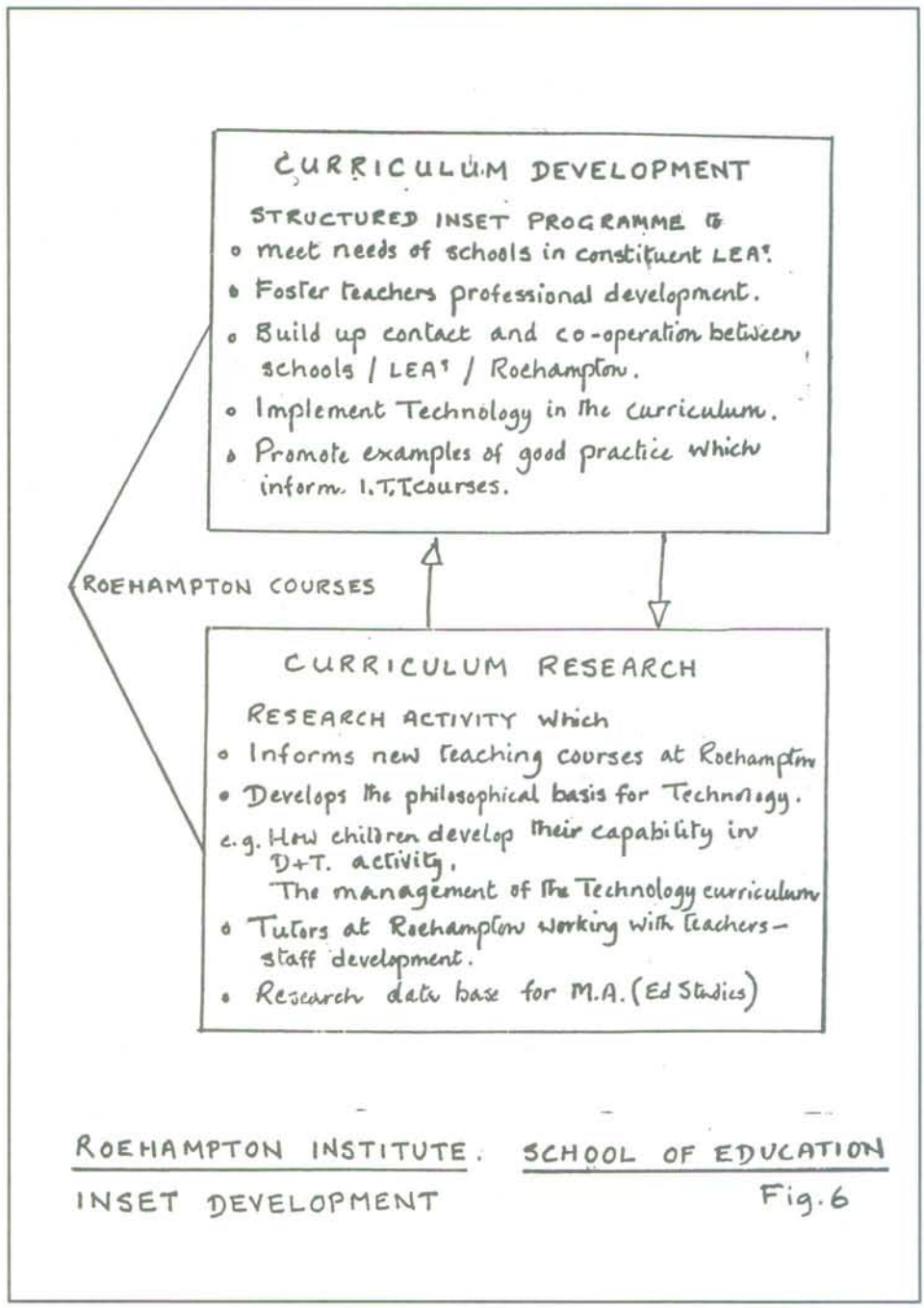

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Fig.6

