Abstract

Computing in schools has developed at a considerable rate since its infancy in the Seventies. Computer systems are now present, in varying numbers, in the vast majority of Scottish secondary schools. Computing courses for pupils have also blossomed from the early days of CSYS Mathematics Paper 4 to the present situation where courses such as S1/2 Computer Appreciation, Standard Grade Computing Studies, H-Grade Computing and SCOTVEC 16+ Computing Modules are all established. These developments have led to difficulties both in finding qualified staff to run courses and in finding the finance required to buy the computers themselves.

This dissertation traces the development of computing in the secondary sector and then takes an in-depth look at the current provision in one Scottish Region - Fife. All the state secondary schools in the region were asked to provide a variety of information about their computer facilities including the extent of hardware provision, the promoted post structure and cross-curricular computer use. A comparison is then made with Fife's own predictions published in 1984 and also with the 'National Plan' - a national prediction published in 1985.

Where possible constructive criticism has been made and in conclusion suggestions are given which may improve some of the short-comings. These cover such topics as school policy documents, promoted post structure, hardware provision, computer technicians and staff in-service training.

Chapter 1

The Advent of Computing in Schools

1.1 INTRODUCTION

The improvements in technology which resulted in the invention of the microchip have caused more impact on society than perhaps any other development. Indeed one optimistic view is that of JJ Shervan-Shreiber who believes:-

"Of all human inventions since the beginning of mankind, the microprocessor is unique. It is destined to play a part in all areas of life without exception - to increase our capacities, to facilitate or eliminate tasks, to replace physical effort, and to increase the possibilities and areas of mental effort."(1)

In 1977 Eggleston suggested that one problem with schools is that:-

"..they are alleged to have failed to respond to the economic and technological imperatives of the late twentieth century" (2)

I would argue that from relative obscurity in 1978, within a ten year time-span computers have become firmly established throughout the education system, not just as a teaching aid but also as the basis of a separate subject - Computer Studies.

As Evans states:-

"The use of computers in the class-room has developed more quickly than any other single aspect of the education system in the whole of its history and has made huge demands upon those who have been involved." (3)

Drage and Evans see three main areas where the computer can contribute to schools:-

"a) One may learn about computers,
b) One may learn with computers,
c) One may use computers as a tool, as a stimulus to ideas, as a resource and as a means to gain access to information." (4)

The first of these is in agreement with Statz who states that:-

"..a student growing up in a technological society needs to understand the variety of computer uses, and the social and political ramifications of those uses." (5)

Alternatively the rationale of the Standard Grade Computer Studies document states that:-

"Society is experiencing many changes as a consequence of the growth in the use of computers; education should reflect these changes. It is important ... to understand and to be able to adapt to continuing technological development. Equally it is essential to learn to cope with its effects on everyday life at home, at work and in leisure time." (6)

which suggests more of a passive acceptance of such change rather than an education to control the direction of technology.

The rationale of the Higher Grade document points out:-

"...the severe shortage of manpower skilled in Information Technology and the resulting need for greater numbers of young people ... well qualified in areas such as computing studies." (7)

It is important to note however that these shortages are at graduate level and it is unlikely that schools can contribute to its solution.

Whether either of these courses will or even should, solve the problem issues they raise is debatable but neither of these appears to justify the large amounts of money spent on equipping schools with hardware.

Indeed I believe some of the Standard Grade content to be of dubious value regarding its compatability with the Standard Grade rationale and the claim of courses such as the Higher Grade to alleviate man-power shortages is in fact contradicted elsewhere, by J J Wellington for example who suggests:-

"The increase in school computing courses in the 1980s may have contributed to the shortfall of key personnel for the Information Technology industry" (8)

It is perhaps in the other two of Drage and Evans' categories that the real value of having computers in schools lies. Schostak (1987) states that:-

"The computer ... offers the curriculum developer gateways into an immense and open frontier of cultural experiences.. (which some) .. will see as an exciting chance to explore and develop new ways of seeing and expressing experience in negotiation, or discussion, or dialogue, with their fellow explorers." (9)

Indeed he sees Information Technology as changing the role of the teacher in all subject disciplines and offering a challenge to teachers which:-

"provides a medium of exploration where the agendas are always up for .. re-formation, de-formation, (and) transformation." (10)

Although this somewhat naively ignores the restrictions of a centrally controlled curriculum, he believes if teachers adapt this stance they will have a

"creative way of framing, unearthing, reflecting upon, exploring, expressing, and questioning the structures through which everyday life unfolds. (Which) as such will be vital to the life of every individual." (11)

If this could actually occur it would be of great value since as Schostak himself states:-

"the point of education is to set into motion, to inquire into possible courses, to generate curricula for the pursuit of life." (12)

Some of Schostak's views are supported by Bork (1984) who predicts that Information Technology will cause radical changes in education over the next twenty years. He believes that:-

"Schools will be very different at the end of that period (twenty years)..(and)..the role of the teacher will be different from that in our current educational delivery system." (13)

The reason he puts forward for this is two-fold: both the rapidly developing technology and the decline in standards of education using 'traditional methods'.

He believes two factors to be critical in establishing the computer as an effective teaching device:-

"..the interactive nature of computer based learning, and the ability to individualise the learning experience to the needs of each learner." (14)

These are particularly important since they would go a long way towards offsetting one of the major problems in today's education system.

Bork sees this as being:-

"..the fact that we have lost one of the most valuable components in earlier education, the possibility of having learners who are always playing an active role in the learning process." (15)

He continues to offer a possible solution:-

"..But we can develop good computer based learning material in which the student is always active." (16)

It is the unique power of the computer as a very rapid 'information processor' which allows it to perform these functions. With the correct software a computer is capable of what Wood descibes as:-

"..the four essential elements of learning: breaking down knowledge into small amounts; active response; feedback or reinforcement; and self-pacing." (17)

Evans agrees with the potential benefits but feels that pupils will first have to relearn how to actively seek knowledge:-

"The learner will need to change the previous habit of being a passive receiver of knowledge and regenerate the style of learning with which he was familiar in junior school - active seeking out of knowledge in a thematic learning situation." (18)

Evans also believes that schools will undergo a change in emphasis:-

"..from the ancient (and generally irrelevant) traditional subject areas to training for integration into society, fundamental skills, introduction to necessary and mind-broadening experiences - in short a curriculum for life rather than examinations. "(19)

This perhaps describes a more general trend which has been on-going in education for some considerable time. It is based on Durkheim's ideas in 'The Division Of Labour In Society' (1964:-Collier Macmillan). These have been interpreted more recently by contemporaries including Bernstein and Burns and Stalker who suggest:-

".. the concepts of 'organic' and 'mechanistic' solidarity (which) can be used to indicate the emphasis within a society of one form of social integration rather than another" (20)

These are perhaps best explained by Denys John who states:-

"...The mechanistic form is appropriate to stable conditions and emphasizes specialized differentiation of tasks designated by immediate superiors, a hierachical structure of control, authority, and communication, insistence on loyalty and obedience, and separation of individual tasks from the ends of the concern as a whole.
The organic form, which is appropriate to changing conditions, fresh problems and unforseen requirements, is marked by the contribution of knowledge and experience to the common task, the diffusion of responsibility, a network of control, authority and communication.....and emphasis upon information and advice rather than instructions and decisions." (21)

The trend in schools in general is towards organic solidarity, leading to more complex division of labour and a greater differentiation of the teachers' role since schools must be 'open' systems and responsive to current educational trends. The philosophy of modern courses is such that pupils are being taught fewer bald facts; emphasis is now much more on problem solving and practical abilities thus enabling pupils to cope not only with problems which they have already met but to be able to apply problem-solving techniques to new types of problem. How far this trend has actually progressed is a matter for debate and is beyond the scope of this paper but it may be here, that the power of the computer as a tool can be of value.

Atherton believes computing may also be of value in teaching the 'hidden curriculum' since:-

> "Pupils find it interesting.
> It has vocational relevance.
> It teaches self-discipline.
> It teaches humility.
> It is an encounter with modern technology.
> It affects our lives in an increasing number of areas.
> It has very wide applicability.
> It is fundamentally significant." (22)

Although I believe it to be very difficult to determine the effect of any particular topic on the hidden curriculum, it is possibly to this hidden curriculum that Woodhouse and McDougall refer when they suggest the second of the following reasons for having school computer courses:-

> "1. preparation for employment;
> 2. self-development of the student;
> 3. education for a computer-based society;
> 4. to teach computer use (i.e. operation)
> 5. to teach computer use (i.e. programming)" (23)

These parallel many of the points above but in general seem to stress computing as a subject rather than computing as a tool.

There are obviously different types of computer input into the education system but in general their effect on learning can be grouped into relatively few main headings.

Adams and Jones make use of a system of categorization found in an "Introduction To Educational Computing" - N.Rushby (1979) - Croom Helm. Using this system, the role of the computer in education is classified into four 'educational paradigms'.

These are:-

> "1. Instructional: covering programmed learning, drills, tests etc.
> 2. Revelatory: problem solving, concept teaching, etc.
> 3. Conjectural: model building, exploring, etc.
> 4. Emancipatory: freeing both teacher and pupil to concentrate on essentials" (24)

The first three of these show the various types of software which may be of value to education. In all of these the computer is a teaching aid. Its use depends on our own understanding of how students learn and how we believe a machine can help us achieve our aims.

All of these modes have their uses but also possible dangers. As Adams and Jones conclude:-

"In the instructional mode the computer is a patient if rather limited tutor, sometimes a rather trivial and boring one. In the revelatory mode the computer mediates between the student and a model contained in the program. All depends on the quality of the model. In the conjectural mode, the students create their own hypotheses on the basis of the information they receive from the machine. The success ...depending on the skill of the programmer ..." (25)

In the last of these four - the emancipatory paradigm - the computer is being used to free the student to concentrate on a more important aspect of the learning process, and it is perhaps here that one of the greatest benefits of the technology may be gained.

If pupils can learn to use a computer as readily as they now use a pocket calculator it will become:-

"... a means to discovery - a powerful tool in handling unthinkable quantities of information, a gateway to whole new worlds of communication, a means of controlling our environment and a slave which will work untiringly to release the user from tedious repetitive processes which have no ultimate bearing on the aquisition of knowledge." (26)

In short in today's busy curricula "it can create 'space' in which young minds can be taught to think and explore ideas for themselves" (27)

In summary I give my own reasons for having computers in schools which involve not only computer courses, but also the use of computers in other areas.

A) Industry requires competence in computing at two levels. At the first level, employees in many areas must be computer literate and this literacy can be developed throughout secondary school in various ways. At the second level, a minority of people require to be trained, to a greater extent, as computer professionals. Although for areas such as programmers, computer-engineers or computer-designers this really requires education at a tertiary level, a beginning can be made in school via more specialised courses. There is also a danger here however that courses concentrate on outdated specifics. As Norton-Grubb (1984) criticises when commenting on the vocational significance of IT:-

"The tendancy towards too-specific training driven by pressure to be 'relevant' (and) In the high-tech area, an emphasis on specific skills (the pace of change rapidly making them obsolete)." (28)

B) Computers can improve pupils learning skills in general, and more specifically, can improve learning in particular subject areas. As stated in 'The National Plan':-

"The introduction of micros into the class-room will bring to teachers a rich resource which must be seen as an ally." (29)

This is perhaps an over-simplification of some of the issues above but by exploiting the possibilities of Information Technology, pupils have at their disposal more powerful tools for problem solving and information handling which gives greater scope for firing the imagination and generally expanding horizons.

C) In modern society citizens need to be aware of the technology that will affect their lives. Since the normal means of passing on knowledge is in school, one approach to this could be a "Computer Awareness" course, offered to all pupils. Computer Awareness is defined by Watt as being:-

"a collection of skills, values and relationships that allows a person to function comfortably as a productive citizen of a computer-oriented society." (30)

This may be a short term course both since its aims could be catered for in a well established cross-curricular approach, and also since increased sophistication in computer systems means they require less and less specialised knowledge to operate them.

This latter point is also mentioned by T.Roszak (1986) who argues:-

> "The fact is, each generation of computer users requires fewer special skills, requiring less 'literacy' of users, in much the same way that advances in automotive engineering have made driving a car easier." (31)

D) Computers can make a contribution to school administration generally making it more efficient.

The opportunity is there if teachers are made aware of it and are sufficiently trained to take it. As Colin Terry states:-

"Whatever arguments are presented for or against the use and usefulness of computers in education, the microcomputer has become an available and flexible resource for the school, even though it has yet to become an available and flexible resource for most classroom teachers. The potential though is clearly there." (32)

Needs

If as argued above, it is accepted that computers can be of great benefit to students, it is worth looking at what provision schools need to exploit this potential, and also whether or not they actually have it. I would suggest that in the short term the following are required:-

a) sufficient hardware and time-table space to ensure all pupils experience a computer awareness course (probably in S1 or S2).

b) sufficient hardware and time-table space to ensure all interested pupils are able to follow a course of further study in computing (in S3/4 or even S5/6).

c) Sufficient software, hardware and training to enable staff to be able to use the computer as the resource it should be both in Computer Aided Learning and as an information processing tool.

However once c) is properly established and computing is used fully in a cross-curricular context the need for a) will disappear.

Before looking at secondary schools in depth to see what they actually have, I will trace the developments which have given rise to the present situation in the secondary sector. I will tend to concentrate on 'Computing Studies' as a separate subject since this is where the main influences appear to lie but its development has also been affected by cross-curricular needs.

1.2 How subjects develop

According to Layton, there are three main stages in the evolution of a school subject. In the first stage:

"the callow intruder stakes a place in the timetable, justifying its presence on grounds such as pertinence and utility. During this stage learners are attracted to the subject because of its bearing on matters of concern to them. The teachers are rarely trained specialists, but bring the missionary enthusiasms of pioneers to their task. The dominant criterion is relevance to the needs and interests of the learners."

In the interim second stage:-

"a tradition of scholarly work in the subject is emerging along with a corps of trained specialists from which teachers may be recruited. Students are still attracted to the Study but as much by its reputation and growing academic status as by its relevance to their own problems and concerns. The internal logic and discipline of the subject is becoming increasingly influential in the selection and organisation of subject matter."

In the final stage:-

"the teachers now constitute a professional body with established rules and values. The selection of subject matter is determined in large measure by the judgements and practices of the specialist scholars who lead enquiries in the field. Students are initiated into a tradition, their attitudes approaching passivity and resignation, a prelude to disenchantment." (33)

For modern subjects trying to gain a foot-hold on the curriculum, there are many problems. Today's time-tables are so full at all levels that there must be strong reasons indeed for more inclusions (eg there are 16 subjects on my own school's second-year time-table). In fact the only way a new subject can enter the curriculum is for an 'older one' to drop from favour and either no longer be offered or at least, have less time allocated to it. In order for this to happen someone in a managerial capacity has to decide that the new-comer has a higher priority. In Layton's scheme, Computing is very much in its infancy having probably just passed into stage two. The stages in its development now follow.

1.3 Developments leading to the present situation in Scottish Schools

Computer Education in Scotland started in 1965 when a UK Interdepartmental group was set up

"to consider what steps can be usefully taken in the educational system to improve the supply of trained personnel working with computers, in the light of expected demand for such personnel." (34)

The Government, therefore, were the initial instigators of curriculum interest in Computer Studies.

As a result of this report, in 1967 the Computers and the Schools Committee (The Bellis Committee) was set up:-

"..to consider the implications of computers for schools and to make recommendations." (35)

Their interim report in 1969 saw three areas to consider:-

Computer Education

Computer Aided Learning in School subjects

Computers in School Administration (36)

In their final report, made in 1972, five recommendations were made:-

"

1) An introductory course should be provided for all pupils using the combined skills of teachers \ from various subjects.

2) Further work in computing should be incorporated into the teaching of other subjects. Computer Studies should not be developed as a subject in its own right.

3) All inspectors, advisers and teachers should be made aware of the applications of computers in their own subjects. Those responsible for subject development should be encouraged, in looking ahead, to consider to what extent computers will lead to changes of existing practices.

4) The provision of computing facilities on a regional basis should be continued and expanded, so that the growing and specific needs of schools will be met.

5) A national committee should be set up to guide the development of computer education. A computer education development centre should be established for the dissemination of information, the development of educational material, the coordination of course and conferences, and for international contacts." (37)

These 5 recommendations are significant in that they suggest computing is not solely 'another subject'. Number 3 in particular shows that the improvement in computer technology has implications for ALL subject areas - possibly more so than any subject previously. (The second of these is also interesting because despite this Computing is now very much flourishing as a separate subject.) Society was in fact entering the second industrial revolution and future generations had to be made aware of the fact. As the Bellis Report states:-

"In this second revolution, routine human mental effort is being replaced by computer power and the possibilities for human mental endeavour are vastly increased by its assistance. This rapidly developing new technology is even now such an important factor ... that we cannot escape the conclusion that some knowledge of it should be given to every school pupil as part of a general education for modern living." (38)

One of the main conclusions of the Bellis report was that some general 'Computer Awareness' course was needed for all children but that schools should spread the technology **across subject boundaries** rather than treat it as a distinct subject. (This however, could not be implemented during the 1970s since schools did not possess the necessary hardware. The rapid development of the microcomputer was to change this.)

This 'Social Aspect' had a large influence on the development of computer education because the social impact of microcomputers was so great that it was soon recognised that the developments in industry, the home and society generally had to be reflected in the schools or the education system would become increasingly out of step with the community it was designed to serve.

As is stated in 'Microcomputers In Scottish Schools - A National Plan':-

"The human aspects of (such) changes in society, the effects of micros on the patterns and levels of employment and the consequent need to redefine the meaning of work itself are all central to the concerns of education." [39]

In 1970 an optional paper in Numerical Analysis with Computer Programming was offered by the S.E.D. in C.S.Y.S. Mathematics syllabus, thus tending to encourage the myth that 'Computing is all about mathematics – so they (the mathematicians) should teach it'. This was certainly the case in my own school where the first computer was given to the mathematics department. (The general ill-effects of this are discussed later.)

The subject was now probably entering stage one of Layton's three. It was not yet taught throughout schools but a small niche had been found from which it could develop. Several Committees and Working Groups were set up during the 1970's including 'Scottish Computer Education Group (SCEG) in 1972, Schools Computer Administration and Management Project (SCAMP) in 1977 and the Scottish Microelectronics Development Programme (SMDP) in February 1980.

The last of these was given a budget of £320,000 to introduce computing into schools and colleges. In summer 1980 the SMDP project was extended for a further three years and given a budget of £1,000,000. This was an example of Government-backed development.

Its future activities were to be within the following five broad categories:-

"1. Raising general awareness of microcomputers in education.
2. Developing a software library and information service.
3. British and International liaison activities.
4. Programming support for project centres.
5. Programming support for special areas of application." [40]

As yet little influence was being applied by other bodies. The appointment of Kenneth Baker as the Minister for Information Technology signalled the Government's further interest and concern in this field. In 1981 the Department of Trade and Industry announced its "Micros in Schools" initiative, in which, to encourage computing in schools the DTI would contribute 50% of the cost of an RML 380Z or BBC microcomputer to any school buying one. Now, in an attempt to gain political capital the Government was playing a large part in the development of computing as a subject. It appears however that this was not their intention. If the 'Micros in Schools' scheme is looked at in more detail several important decisions taken by the Government can be seen. At the time of the report most of the micros in British education were American. This was due to the fact that, although their prices were equivalent, the American models had much more software available - and a computer without software is of little use. By encouraging schools to buy British (with the half-price offer) more firms were encouraged to write software for the British market, thus leading to the situation in 1984 where virtually all the schools were standardised on British micros. (SMDP Survey 1984) [41]

This did however have the drawback of preventing schools from using the large base of software already available in the United States.

Since the majority of the Government-recommended micros were primarily designed for home-use, there was another off-shoot to the scheme. Parents wished to buy their children 'school - compatible' computers for home use and the schools themselves started to buy other peripherals (eg printers, monitors, disc-drives) since these were not part of the D.T.I. scheme.

The result of all this was that the British computer industry received a tremendous boost in sales. On further investigation it appears this was the intention from the start. Margaret Thatcher - the Prime Minister - noted in 1982 that:-

"As well as helping young people develop their skills and understanding in technology, the schemes will stimulate the positive development of the microcomputer industry in this country, including the software industry." (42)

Some Regions took the next initiative by independently developing their own policies of microelectronics. These varied in timing, arrangements and types of computer. The first Regions to develop policies were Fife and Lothian, although they both standardised on different computers (Fife on RML 380Z and Lothian on Apple), with Tayside being the first Region to put computers (Apples) into all its schools. The Lothian and Tayside moves are especially noticeable since they both chose machines which were NOT supported by the Government D.T.I. scheme. Fife's choice of RML was later to be changed to the BBC model B. The latter is a more versatile machine with the facility to add a host of peripherals. In addition better software started appearing for the BBC.

In 1982 working parties were set up by the MCC (Microelectronics, Computing and the Curriculum project) under the auspices of the Consultative Committee on the Curriculum (CCC), to produce guidelines for computer courses in S1/S2 and S3/S4.

This was because schools were beginning to offer courses at S1/2 level due to the work of enthusiastic teachers and as a response to public demand.

The Project Steering Committee (PSC) of the MCC published their guidelines and many of their recommendations were used as a basis for these courses covering such material as:-

"What are computers?
What can computers do?
How will computers affect you?
History of Computers
Computer Personnel" (43)

However these teachers required training. Therefore on the advice of H.M.I.'s the Colleges of Education offered a Teaching Qualification in Computing. This was initially not of a high standard and indeed the SED reduced the normal academic requirement from two to one relevant graduating courses in an attempt to attract teachers. (This decision to drop standards - which has since been reversed - is in many ways responsible for the present problems teachers are experiencing in offering Higher Grade Computing Studies). A further problem was that pupils further up the school also demanded a course. So after consultation between the CCC and the Scottish Examination Board (SEB) the first SCE exam in O-grade Computing with 20 schools throughout Scotland piloting the course started in 1984.

This exam was 'opened Nationally' in 1985 and a large percentage of schools in Scotland entered candidates for it. Since then the numbers have increased substantially, as table 1 (below) shows:-

	1984	1985	1986	1987	1988
Presentations in Computing	503	594	1944	3597	5386
Percentage of Age Group	---	---	---	2.9	4.6

Table 1 : Ordinary/Standard Grade Numbers 1984-88 from S.E.B. annual statistics

The percentages are comparable to subjects such as:-

History (Trad)	2.9%	
A.P.H.		3.5%
French (Alt)	6.0%	
German (Trad)	5.4%	
Latin	2.6%	
Music	3.3%	

The figures can also be compared to the parallel 'boom' in England, obviously on a larger scale, which took place slightly earlier.

Year	CSE	O Level	AO Level	A Level	CEE	Total
1977	15218	6091	109	1764	---	23182
1978	15489	8417	511	1769	223	26419
1979	16210	11635	765	2323	591	31524
1980	17901	14907	1049	2819	635	37311
1981	23590	22546	1374	3947	1250	52707
1982	32261	37868	1524	5825	1531	79009

Table 1a : Examination entries for England & Wales 1977-82 [44]

Using the criteria of 'Examination success', and comparing presentations with other subjects, Computer Studies was now established. By way of further development in Scotland, in 1986 Standard Grade courses were started. These will parallel the O-grade for some time yet, but by 1991 will replace it. Finally, a discussion paper for H-grade Computing was published in 1987[45] and in 1988/9 H-Grade courses were offered for the first time by schools from several Scottish regions. For the statutory three-year trial the Universities will provisionally accept the Higher as an entrance qualification (subject to some revision) so establishing computing as a separate subject. There are also many schools offering 'short courses' in computing at various levels including a selection of SCOTVEC modules. These were greeted with enthusiasm in 1984, particularly by the teachers in the schools since at that time there was little in existence for S 5/6 pupils except the O-Grade, and nothing at all post-O-grade.

I believe we are now firmly established in stage two of Layton's three. There is at least one qualified teacher of Computing in many Secondary Schools as will be shown later, and this could be seen by some as part of the reason for the rapid growth of the subject. As it became established, so it opened up promoted posts for those with the correct experience and qualification . This has led to a rapid rise by some which would be unheard of in other subjects (and could be compared to the 'Modern Studies boom' of 10 years ago). The reasons for this are simply that there were (are) few qualified and experienced people around, and those who survived the transition and upheaval were rewarded for their efforts, since many schools have established departments with Principal Teachers running them (and in one Region APT's as well). The problem is that Computing as a subject, is likely to outgrow itself. It is by no means a static subject, moving so quickly that the teachers can barely keep up. What is currently being taught as S1/2 Computer Awareness will, within 5-10 years be taught in primary school, thus making the present secondary school course redundant. We then have the choice of updating the course and bringing more specialised knowledge down the school or deciding that the present level of pupil-learning in primary is sufficient.

Obviously there are limits in terms of a child's development and the concepts which he/she can grasp, but many primary schools have large amounts of computer activity taking place.

One suggested scheme for Australia, by Woodhouse and McDougall is shown below:-

"Primary School

Year 1 - playing & exploring with eg robot turtle
Years 1/2 - word processing with teacher typing
Year 3 on - more word processing with pupils typing
Years 5/6 - Information Handling (databases etc.) and
LOGO for problem solving and programming

Secondary School

Junior school - Computer literacy
Middle school - Computer Studies
Senior school - Computer Science" (46)

This is only one suggestion but could well fit in with the Scottish education system too. However before any such plans could be made an investigation into just what is happening in our own primary and secondary schools would be needed.

One final important developmental point is the position of computing within the new Scottish 'National Curriculum'. (47) The C.C.C. published a document called 'Curriculum Design for the Secondary Stages' in 1987 which sought to standardise the breadth of curriculum on offer in Scotland. It is significant to note that Computing appears in the S1/2 curriculum in the enrichment areas for both the Mathematical and the Technological Modes. At S3 level this is taken further where it appears in both the core and elective area of the Technological mode. As this document becomes implemented this inclusion should ensure once and for all that computing is established as a subject in Scottish secondary schools. Whether in its present form, this is desirable is another question.

Despite the great interest from pupils it could be that in educational terms they would benefit more from the present hardware in schools being used in a cross-curricular manner.

As JJ Wellington has discovered (1989) some schools are now actively stopping computing courses to encourage an IT across the curriculum approach.

"We are dropping Computer Studies as an examinable subject - concentrating on IT, with a firm commitment to spread IT across the curriculum." (48)

To investigate to what extent this is happening and to discover the hardware provision schools have at this time and the uses to which it is being put, some research was necessary.

Chapter 2

The Survey

2.1 The Intention Of The Research

Chapter One gives a general picture of the need for computing in secondary schools and how its development has progressed. The intention of this research was to look at the present situation both in terms of its adequacy in coping with current requirements and also to see how it compared with predictions made some time ago. The predictions come from the following sources:-

The first of these is Fife Region's own document - 'Microcomputers In Schools' [49]. This contains the 'five year plan' whereby all secondary schools within the Region would be expected by 1989 to have a stated **minimum** hardware provision, as follows:-

"2 x 380Z Systems, 10 x BBC Model B systems (networked with R380Z as host), 4 x printers..... appropriate software." [50]

However, the document also stated categorically that

"schools may **not** use funds from 'A' allocation to purchase Microcomputers" [51]

thus ensuring that if the provision were not adequate schools could not remedy the position with normal funding **even if they felt they could afford to do so.** (This position has now changed somewhat and schools may purchase hardware from 'A' allocation funding if their total price does not exceed 10% of the schools total budget.) [52]

In some ways Fife Region updated the 1984 document in February 1986 with 'Microcomputers in Schools - A Report on Provision and Development.' [53] although the 'Five year plan' was not changed to any great degree, nor was the ruling on 'A' allocation. However for reasons which I cannot ascertain this document seems to have had only limited distribution. Only one of the computing staff in all 19 Fife secondary schools had seen it. I shall therefore refer to both documents.

The next paper worth comparison is a national one. 'Microcomputers in Scottish Schools - A National Plan' produced by the Scottish Microelectronics Development Programme (SMDP) [54]. This document is far more adventurous than the previous one and has a more realistic (if less financially viable) prediction of requirements.

It is worth quoting at some length and states:-

"...it seems likely now in 1985 that the following...will be required within five years in order to satisfy reasonable demands.
Each school would have a network of computers plus a number of stand-alone devices, distributed as follows:-

a. General Purpose Computer Room A: 20 identical work-stations each linked ... to the school's main backing store...

b. General Purpose Computer Room B:Similar to A but with a variety of workstation types and more emphasis on peripherals....

c. General Purpose Computer Room C: This room would contain a smaller number of workstations and would be used as a resource centre for staff and pupils....There may also be a need for work-stations in staff bases.

These GP rooms will be used intensively by teachers of Computing Studies, but **there must be sufficient and regular access for other departments**." [55]

The document continues to give a more general predicted minimum level of hardware provision for the secondary sector of "**1 system per 50 pupils**" [56].

This is also mentioned in a different way in the second Fife document:-

"Current policy is seeking to standardise on networks of 10 BBC's in computer-rooms, together with mobile systems for across the curriculum use up to the level of one system per 50 pupils." [57]

As well as drawing on these papers, reference will be made to another. This was not really a prediction as were the previous ones, but a survey by HMI's into the current uses of computers in schools. 'Learning and Teaching in Scottish Secondary Schools: the Use of Microcomputers' was published in 1987 and although already outdated still contains some useful points. [58]

2.2 Method Of Research

In order to do a comparison and to have a more concrete view of what was actually taking place within a specific area, I decided to prepare a questionnaire for circulation around one Region. I chose the Fife schools,mainly because I am currently employed as a Principal Teacher (Computer Studies) within one of them. Secondly representatives from the Computer departments of all nineteen schools (including myself) meet on a regular (monthly) basis thus enabling many informal ethnographic interviews to take place: also providing supplementary material to that supplied by the questionnaire. The investigation was therefore carried out in two ways - in one - the formal - a questionnaire was sent to each secondary school for a written summary of the school provision.

In the other - less formal - information was amassed over a period of time at regular meetings of computer personnel.

Fife Region was approached in October 1988 and permission asked to circulate all Fife secondary schools with a questionnaire (see Appendices I/II). This was received during November, and a copy of the questionnaire sent to each Fife secondary school along with a covering letter (see Appendix III) asking each head-teacher for their approval and help, during early December.

As to the questionnaire itself, it was decided to have four sections comprising:- 'the School', 'the Computer department', 'Other departments', and 'Hardware'. Many more questions could have been asked but as it already contained 16 questions it was felt that adding more would make the questionnaire unwieldy and people would be less likely to complete it. From these sections it was hoped to discover the following:-

The School:- minimum details concerning the school including:- number of pupils, number of computer rooms, the post of the teacher in charge of computing, and whether or not a written 'Computer Policy' existed.

The Computer Department:- number of hours taught, age/ability range of pupils taught, number of qualified staff, and amount of technician help.

Other Departments:- is in-service training available?, which departments make use of computers (if so by staff or pupils?), if departments do not - why not?

Hardware:- numbers of computers in each school being used, if machines are networked, if S.C.A.M.P. is installed, and if Viewdata access is available.

2.3 Analysis of Results

In view of the nature of the investigation it seemed right that the results should be analysed and presented by computer as far as possible. To this end it was decided that a 'Spreadsheet' would be the best aid to data collation. Other possibilities were investigated such as a 'Database' and even a custom-built program but the Spreadsheet offered the best compromise in terms of facilities offered against ease of use. Since only nineteen schools were being investigated the actual number of questionnaires to be processed was fairly manageable. Two problems arose however. One was that many questions had several possible answers and if a Spreadsheet column was allowed for each the whole output would become very unwieldy.

The second problem was that a spreadsheet can only analyse numerical data and so textual answers had to be turned into numbers.

The method used to solve these problems is detailed in Appendix IV.

The intention was then to compare the results with the two published predictions for computing provision for 1990 onwards.

Completed forms began arriving in mid-December and by early January a 100% return (19 completed questionnaires) had been achieved. In addition to these, at a meeting in December I collected more detailed information on SCOTVEC computing modules being run in each school. This is also presented with the results.

Chapter 3

The Results

As explained above all the results were entered into a spreadsheet for analysis. This is given in its entirety in Appendix V. The results are given below in five sections. These correspond to the four sections of the questionnaire plus a section on SCOTVEC module courses. The schools themselves give a good variety both in terms of size and catchment area; ranging from small (570 pupils in school Q) to very large (1735 pupils in school N). In addition to this, four of the schools are 'split-site' (C,D,K and M) ie their school buildings are separated into two distinct geographical areas, and three (A,G and H) were used to pilot the Technical and Vocational Educational Initiative (TVEI) scheme (which involved large financial input from the Manpower Services Commission).

3.1 Section 1 - The School

The answers here, as in all sections, contain some forward predictions. Where a school replied that an event was happening during this academic year (e.g. the installation of a new computer room) this was included as if it already existed. While this gives a slightly tainted view of things it was felt justified in obtaining the most up-to-date picture of the situation possible.

The table below gives in summary form, the collated answers to all the questions in the School section (Question numbers 1-4).

TABLE 2 : Results on 'The School section' (Q.s 1-4)

School	Policy 1=Y:0=N	Pupil PT/APT Nos.	No.of Rooms
A	0	1 1400	2
B	0	0 1332	2
C	0	1 1200	2
D	0	0 1696	2
E	0	0 1400	2
F	0	1 1680	2
G	0	0 1100	1
H	1	0 940	4
I	0	1 1300	3
J	0	0 600	2
K	0	0 1500	3
L	0	1 854	2
M	1	1 1500	4
N	1	1 1735	3
O	0	0 780	2
P	0	0 740	1
Q	0	0 570	2
R	0	1 1300	3
S	0	0 600	1
Total	P.T.	1735	4 HIGHEST
3	8	570	1 LOWEST
	A.P.T.	1170	2 AVERAGE
	11	22227	TOTAL

The schools investigated (19 in all) are coded A-S.

Where a school computing-policy existed this was coded as a '1' otherwise a '0' was entered. Only three schools had written computer policies (H, M and N). If the person in charge of computing in the school was a Principal Teacher a '1' was entered, otherwise a '0'. Eight schools at this time (January 1989) have Principal Teachers and eleven have Assistant Principal teachers.

The approximate pupil roll for each school is entered as a number. These range from 570 in school Q to 1735 in school N. This gives an 'average' school roll for the Region of 1170 and 22227 as the total number of pupils attending state secondary schools. Finally in this section, the number of 'custom built' computer rooms is given. These range from 1 in three schools (G,P and S) to 4 in two schools (H and M). This gives an average of 2 computer-rooms per school.

3.2 Section 2 : The Computer Department

The table below gives in summary form, the collated answers to all the questions in the Computer Department section (Question numbers 5-7).

TABLE 3 : Results on 'The Computer Department' (Q.s 5-7)

	Class Time (mins/week)						Total	
				Dept.	Qual.			
School	S1/2	S3	S4	'H'	16+	TVEI	Hours	Staff	Tech.
A	100	800	720	0	200	480	38.20	2	1
B	1040	720	360	0	465	0	43.05	2	1
C	420	875	600	0	175	280	39.10	3	100
D	1040	780	390	0	260	390	47.40	2	100
E	640	200	400	0	520	240	33.20	3	1
F	920	400	680	0	320	0	38.40	2	0
G	880	360	360	0	160	240	33.20	1	0
H	490	700	525	0	420	0	35.35	1	1
I	320	800	1080	0	160	0	39.20	3	100
J	0	600	400	0	320	0	22.00	1	0
K	700	440	360	0	1530	525	59.15	6	1
L	448	384	960	0	192	384	39.28	4	1
M	550	950	965	0	0	0	41.05	4	1
N	800	800	800	0	280	0	44.40	5	1
O	175	175	180	0	0	0	8.50	2	1
P	240	600	320	0	160	0	22.00	2	1
Q	320	400	0	0	840	0	26.00	2	100
R	760	800	800	0	320	240	48.40	2	10000
S	320	360	180	0	520	0	23.00	1	1

HIGHEST	1040	950	1080	0	1530	525	59.15	6	>80m
LOWEST	0	175	0	0	0	0	8.50	1	1
AVERAGE	535	587	531	0	360	146			3 40-80m
TOTAL						48	4		

<40mins
11

No Tech
3

The table is in three main sections showing hours and type of pupil contact time, the numbers of qualified staff in each school and the amount of technician help on offer in each school.

The class time is sub-divided into year groups showing the number of minutes taught by the whole computer department (ie pupil-contact time) per year group. This was calculated from the information in question 5 by multiplying the 'number of sections' by the 'time for each'.

At S1/2 level the pupil contact-time varies from none in school J to 1040 minutes (17 hours 20 minutes) in schools B and D. The average is 535 minutes.

At S3 level the pupil contact-time varies from 175 minutes (2 hours 55 minutes) in school O to 950 minutes (15 hours 50 minutes) in school M. The average is 587 minutes.

At S4 level the pupil contact-time varies from none in school Q to 1080 minutes (18 hours) in school I. The average is 531 minutes.

No schools had any 'Higher Grade' classes.

At S5/6 (16+ module) level the pupil contact-time varies from none in schools M and O to 1530 minutes (25 hours 30 minutes) in school K. The average is 360 minutes.

For computer-based T.V.E.I. courses the pupil contact-time varies from none in schools B,F, H-I,J, M-Q, and S to 525 minutes (8 hours 45 minutes) in school K. The average is 146 minutes. For each school this time was totalled and is shown in hours and minutes under the heading 'Total Dept. Hours'. These vary from 8 hours 50 minutes in school O to 59 hours 15 minutes in school K.

The next column shows the number of qualified Computer-staff in each school. This varies from 1 in schools G,H,J, and S to 6 in school K. The average number is 3, with a total of 48 for the Region.

In this context 'qualified' was taken to mean that the member of staff had either completed or was currently completing one of the following:-

an Additional Teaching Qualification (Secondary Education) in Computing (two weeks)

a DPSE in Educational Computing (two years)

a Supplementary course in Computing methods plus T.Q. (one year)

The final column shows the results of question 7 which enquired about technician time allocated to the computer department.

The four possible answers

More than 80 mins per week

40-80 mins per week

Less than 40 mins per week

Never

are coded as + 10000, + 100, + 1 and 0 respectively using the technique explained in Appendix IV. The results show one school (R) with more than 80 minutes technician time, 4 (C,D,I and Q) with 40 - 80 minutes, 11 with 0 - 40 minutes and 3 (F,G, and J) with none.

3.3 SCOTVEC Survey

It also seems logical to include at this point, the results of the SCOTVEC module investigation. The classes taught at most levels left little room for options (eg S-Grade at S3) but the entire provision at S5/6 is at the individual P.T. / A.P.T.'s discretion.

The titles associated with the various module numbers possible are given below:-

List of Computer Module titles

Note the leading numeral (year of last revision of descriptor) has been omitted.

1091	Introduction to computers
1093	Introduction to Computer Software
1095	Introduction to Computer Application Packages
1099	Computer Applications (Spreadsheet)
1100	Computer Application (Word Processing)
1107	Information Studies
1108	Social Implication of Microelectronics and I.T.
1109	Computer Networks
1110	Computer Graphics
1111	Introduction to Computer Programming (BASIC)
1113	Introduction to Computer Programming (COMAL)
1115	Introduction to Computer Programming (Pascal)
1121	Computer Programming Project (BASIC)
1123	Computer Programming Project (COMAL)
1125	Computer Programming Project (Pascal)
1126	Introduction to Prolog

A summary of the modules chosen by each school appears below.

Table 3A : SCOTVEC Modules being offered by each school

SCOTVEC modules school has/does /will offer

shown as --- has does will

+ 10000 +100 +1

School	1091	1093	1095	1099	1100	1107	1108	1109	1110	1111	1113	1115	1121	1123	1125	1126
A	10000	1				10000	1									
B	10101		101					1								
C	10100	1	100		100											
D	100				1											
E	100	1	1	100	100			100	10000		1					
F	10101		101		1				1							
G	1	100			100	100		100	1							
H	100		100			100										
I	100	10000	100		10000		100	100	100	100	10000		1			
J	10101		10101			10101		10000								
K	10101	10101	101			101		10101		10101						
L	100		101													
M	1				1	1	1									
N		10000	101			10001	10001	10101	10000	10000		10000	1			
O	10000	10000				100	100									
P	10100		100													
Q	100	100			100	100		1								
R	100		1			100		100								
S	100				100	100		100								
Past	7	5	1	0	0	1	0	0	2	2	4	1	2	1	1	0
Present	14	3	10	1	1	0	1	0	7	8	3	1	3	1	0	0

Future	6	3	9	0	0	0	0	1	5	2	4	0	2	3	0	3
Ever	17	9	13	1	1	1	1	1	10	11	7	2	7	3	1	3

A similar coding system to the one mentioned above has been used here. This time the three categories are as follows:-

If school HAS run module at all ... + 10000

If school is CURRENTLY running module ... + 100

If school INTENDS to run module in the future ... + 1

From the table, the most popular module is 1091 "Introduction to Computers" as it has, is or will be offered in 17 of the 19 schools. Of the remainder 1093, 1095, 1110, and 1111 are also popular all having an 'ever' entry of 9 or greater.

Note that of these only 1110 - Computer Graphics - may be described as being at a level other than 'introductory'. There is no particular trend obvious in the others as they appear in various schools.

3.4 Section 3: Other Departments

The table below gives in summary form, the collated answers to all the questions in the 'Other Departments section (Question numbers 8-11).

TABLE 4 : Results on 'Other Departments' (Q.s 8-11)

	USE BY VARIOUS DEPTS							TEACHER :PUPIL							Reason	Use of
								Staff for non C'r room								
	English	Maths	Science	Tech.	Music	Mod.Lan	H.E.	Soc.Sci	B.Stu	Art	PUPIL	STAFF	I/S/T	use by	by other	
School	T:P	T:P	T:P	T:P	T:P	T:P	T:P	T:P	T:P	T:P	TOTAL	TOTAL		staff	staff	
A	100	100	100	100	100	0	100	100	101	100	1	9	10100	10000	100	
B	100	101	100	100	100	101	101	101	101	100	5	10	10101	10000	10000	
C	101	101	101	101	0	0	0	101	101	101	7	7		100	0	

D 100 100 1 101 0 0 101 101 101 101 6 7 10100 100 100

E 101 101 101 101 101 101 101 101 101 101 0 9 9 10101 10000 10000

F 101 101 101 100 100 100 100 101 101 0 5 9 10100 1 10000

G 1 1 1 1 0 0 1 1 1 1 8 0 10000 100 1

H 0 101 101 101 0 0 101 101 101 101 7 7 10000 10000 10000

I 1 101 101 101 0 101 1 1 101 0 8 5 10100 100 10000

J 0 101 101 0 0 0 0 100 0 0 2 3 10000 100 10000

K 0 100 101 101 100 100 101 101 101 0 5 8 10000 100 10000

L 101 101 101 101 100 101 101 101 101 100 8 10 10100 10000 100

M 101 101 101 101 100 100 101 101 101 0 7 9 10101 100 10000

N 101 100 101 100 0 100 101 100 101 101 5 9 10000 100 1

O 100 1 1 101 100 101 101 0 101 0 6 6 10000 100

P 0 101 101 101 100 0 101 101 101 100 6 8 10000 0

Q 101 1 101 100 0 0 101 100 101 0 5 6 10100 100 10000

R 0 101 101 101 0 101 101 0 101 101 7 7 10100 1 10000

S 101 101 101 101 0 0 101 0 101 0 6 6 10000 10000 0

==========

==========

Staff 12 16 16 17 9 10 15 14 17 9 Fam'r H'ware >120mins

Pupils 10 15 17 13 1 6 15 12 18 6 16 8 10

W/P Int'st 40-120m

10 9 4

Dept.Ad S'ware <40mins

3 2 2

None Never

3 3

The table is divided into four main sections. The first of these, which gives details of specific department involvement with computing, is further sub-divided into subject areas. For reasons similar to those explained in Chapter 2 the results are again coded.

If the teachers within a department make use of computer facilities for their own use (eg for word-processing of worksheets) then add 100. If the department uses the computer facility with pupils then add a further 1.

Therefore an entry of '100' under the 'English' column means the English staff in that particular school use the computing facility, an entry of 1 in a column means the pupils are encouraged to use it and an entry of 101 means both make use of it.

Ten departments are actually detailed in the table. Results showed that these were the most common users of computers although several other departments also made use of them (eg Religious Education, Latin and Special Education). The columns headed 'PUPIL TOTAL' and 'STAFF TOTAL' show, for any particular school, the total number of departments which use computers both in terms of staff and in terms of pupils. This was included to try and give an overall picture of the school view to computer aided learning rather than look at odd departments which might simply have 'an enthusiast' within them. The results show that staff in two schools (B and L) make most use of computers with all 10 departments using them). However if pupil numbers are looked at school E comes out top with 9. At the other extreme, school G has no staff (outwith the computer department) using computers while school A only claims one case of pupil involvement.

Similarly, in order to obtain a region wide view by department both staff and pupil totals for these are given at the foot of each column.

In terms of staff use, Technical and Business Studies departments come out best with mentions in 17 schools, whereas Music and Art are at the other

extreme with only 9. From the pupil point of view Business Studies is again top with 18 mentions while Music has only 1.

The last three columns in the table again use the coding system detailed in Chapter 2. The first of these, headed 'STAFF I/S/T' shows the level of training available to staff with each school (question 8).

The four possible answers were as follows:-

General computer-familiarisation

Word processing or Desk Top Publishing

Computerised Department Admin.

None

These categories were not mutually exclusive. 'Computer Familiarity' proved the most popular with 16 schools offering it. 'Word-processing' was offered in 10 schools with 'Department Admin.' in 3. Three schools (C,O and P) offered no training for staff. In each case of training being offered it was co-ordinated/run by the P.T./A.P.T. in charge of computing in the school.

In an attempt to find reasons for staff not using computer provision question 11 asks the most important reason for this. The three possible answers were:-

Lack of suitable hardware/access time

Lack of interest

Lack of software

Eight schools gave lack of hardware as the most important factor, nine gave lack of interest and only two, lack of software.

The last question in this section related to other departments using the main computer room(s) as distinct from their own provision. The possible answers here were:-

Greater than 120 mins / week

40-120 mins / week

0-40 mins per week

never

Ten schools were in the >120 mins category; four were 40-120, two 0-40 and three 'never'.

3.5 Section 4 - Hardware

The table below gives in summary form, the collated answers to all the questions in the Hardware section (Question numbers 12-16).

TABLE 5 : Results on 'Hardware' (Q.s 12-16)

	Hardware Nos.					Ratio				
						Total pupil:		Prestel		
		Amstrad		Computer		comp'r	Network		TTNS	
School	BBC	B/M	R380Z	P.C.	Other	In Use	1 : ?	System	SCAMP	Neris
A	30	0	20	0	50	28	1	1	100	
B	39	0	17	8	64	21	0	1	10001	
C	48	0	21	0	69	17	0	1	10001	
D	51	0	20	2	73	23	1	1	10000	
E	41	0	20	0	61	23	0	1	10001	
F	45	0	15	1	61	28	0	1		
G	45	0	21	1	67	16	1	1	10001	
H	50	0	20	0	70	13	1	1	10101	
I	40	0	16	0	56	23	0	1	10000	
J	26	3	0	0	29	21	0	1		
K	37	0	20	1	58	26	0	1	10101	
L	70	0	20	0	90	9	1	1	10001	
M	60	2	15	0	77	19	0	1		
N	45	0	17	0	62	28	1	1	1	
O	38	1	17	6	62	13	0	1		
P	31	0	15	1	47	16	0	1		
Q	34	0	15	0	49	12	0	1	10001	
R	55	0	21	0	76	17	0	1	10000	
S	19	0	20	0	39	15	0	1		
HIGHEST	70	3	21	8	90	28	6	Total Prestel		
LOWEST	19	1	0	0	29	9		19	11	
AVERAGE	42	2	17	1	61	19			TTNS	
TOTAL	804	6	330	20	1160				3	
								Neris		
								9		
								None		
								6		

The table is in five main sections, the first of which is further sub-divided. This was an attempt to find out information on all the hardware present in each school. Where computers existed but were no longer used (eg ZX81) schools

were asked to discount these when replying. The results show that the numbers of BBC model B or Masters (the Region's 'main machine') vary considerably from school to school with a maximum of 70 in school L and a minimum of 19 in school S.

(Note that this second figure may be lower than the actual number contained in the school. This particular form was very vague about answering this question. If this is the case, school J becomes the lowest with 26). Although all schools have at least one R380Z machine, most chose to discount this when replying . Of those that replied positively, school J has 3, school M has 2 and school O has 1. All of the others claimed 'zero'.

The next column is concerned with new 16-bit machines - the Amstrad P.C. The highest number here was 21 claimed by three schools (C,G and R) whereas the lowest was school J which claimed 'zero'. (This result seemed odd and on further investigation it seems the school does have some but they are still lying in boxes unused. For a more accurate picture therefore perhaps schools F,M,P and Q with 15 each should be taken as the lowest.)

A fourth column was left for any other computers not yet mentioned which schools were making use of. Types were many and varied but numbers range from 8 in school B to 0 in most of the others. A crude total was taken of all the machines in a particular school. Again there may be some inaccuracies here for reasons mentioned above but the results show that school L is the best equipped with 90 computers, with school J at the other extreme with 29.

This gives an average number across the region of 61 computers and a total of 1160 computers currently in use (December 1988) throughout all Fife secondary schools.

The next column - 'Ratio pupil : computer' - was calculated by dividing the pupil roll figures for each school (see Table 2) by the total number of computers (above). The results range from one computer per 9 pupils in school L to one computer per 28 pupils in schools A,F and N.

The average figure for the Region was 19.

The 'Network' column shows all the schools which currently have a Network systeminstalled. (Note that schools which are currently in the process of having a Network installed are also included here.) S ix schools (A,D,G,H,L and N) currently have Networked computers.

The next column shows that all nineteen Fife Secondary schools currently have the Schools Computer Administration and Management Project computer-system up and running.

The final column in this section is coded as explained above and shows which schools have access to on-line VIEWDATA systems. The question offered four choices which were:-

Prestel

TTNS

NERIS

None

The results show that 11 schools have Prestel access, 3 have TTNS, 9 have Neris and six schools (F,J,M,O,P and S) have no VIEWDATA access.

Chapter 4

Discussion and Criticism

The previous chapter shows the results obtained, but so far no interpretation has been placed on them. In an attempt to do so I wish to consider the present position within Fife in relation to several documents mentioned earlier. I shall consider the results from Table 2 first.

4.1 Computer Policy Documents

Only three Fife schools have a written computer policy as such.

Fife Region's own document states that:-

".... each secondary school should produce a policy document, arrived at in consultation with subject departments..... the responsibility for the implementation (of which) should be clearly assigned to a promoted member of staff." (59)

Therefore, not only should there be a policy but a senior member of staff should have responsibility for it. This document was published in 1984 suggesting schools have had plenty time to implement its contents. This view is also borne out by the HMI document in its conclusions where it states:-

"Each school should have a written policy statement..... which covers the use of microcomputers in learning and teaching..... The statement should reflect both education authority policy and the circumstances of the school." (60)

Since many schools had also inserted written comments at the question regarding policy documents, it was possible to see that many schools are currently in the process of writing a computer policy, although I can find no reason why it has taken until now to do so. It could be that the schools themselves see this as a low priority and are reluctant to give time to it, or perhaps lack of follow-up by the region is to blame.

Although their document states that a policy should exist they appear to have taken no steps to ensure that this is so. Perhaps if the region had asked schools to provide a copy of the policy to some central body - Advisory staff for example - it would have received more priority.

Of the schools which do have a policy (H,M and N) those of both M and N were written shortly after the appointment of the present Principal Teacher (Computer Studies) in 1985. Both their documents are based upon the contents stipulated in the Region's own policy statement. (49)

The third school H has a very substantive document prepared in March 1988. However, on the very first page in its introduction it gives the likely reason for this:-

"The HMI post-inspection report on ...(H) High School (May 1986)... made these points:-
'there is a clear need for schools to have a policy regarding the development of computer studies and the use of the computer within departments. .....(H) High School should establish a policy and make it known to staff.... The present situation .... was unsatisfactory.' " (61)

From this evidence it appears to need the outcome of an HMI visit to prompt schools to come up with a policy. Perhaps before the majority of staff will accept computers and take them seriously some formal acknowledgement of their effect on the whole school curriculum needs to be made. Certainly the HMI report -'Learning and Teaching in Scottish Secondary Schools' - seems to indicate that the authority should take a bigger role in initiating such policies:-

"Schools would have benefitted from authorities doing more to highlight the management issues to be tackled to ensure that microcomputers were used effectively in learning and teaching; and from authorities actively promoting the production and discussion of written school policies and guidelines, to complement the issue of education authority policy statements." (62)

This idea is also borne out by FJ Burdett (1987) who suggests:-

"The successful implementation of Computer Assisted Learning (CAL) at the 'chip-face' depends on the management context. In the first instance this relates to the educational institution itself, however the way in which a school manages its resources is constrained by the context within which it functions." (63)

Burdett also believes that long delays will exist between any policy being produced and its incorporation into daily routine. In his summary he concludes:-

"It is relatively rare for there to be any policy at Authority level for educational technology or the curriculum and yet the effectiveness of the use of microcomputers in education could depend on a successful policy for hardware, software, training and staffing." (64)

I would suggest that while Fife appears unusual in having a Regional Policy at all, it does not go far enough. As justified both by Burdett and the HMI report quoted above it should be seen as a matter of some priority to both update the Regional document and produce worthwhile policy statements in each secondary school.

4.2 Head of Computer Department

From the arbitrary nature in which those in charge of computing have been appointed, Fife Region appears to lack an overall policy regarding this area. This section of the results was designed to ascertain what the exact position is. The survey shows that eight of the nineteen Secondary schools in Fife have a Principal Teacher in charge of computing while the other eleven have an Assistant Principal Teacher.

There appears to be an anomaly here because the region agreed in 1984..

".. to appoint a Principal Teacher in Computer Studies provided that the 40 hours stipulated as the requirement for a Principal Teacher post is achieved in the school timetable." (65)

However if the total department hours for the schools with P.T.s are looked a (Table 3) they are as follows:-

School	Hrs/mins pupil contact/week
A	38:20
C	39:10
F	38:40
I	39:20
L	39:28
M	41:05
N	44:50
R	48:40

Using the Region's own criteria only three of these (M,N, and R) should be P.T.'s. In fact in the other schools with A.P.T.'s, several have more than 40 hours (B has 43:05, D has 47:40, and K has 59:15). The department with the biggest teaching-time commitment - school K - still only has an A.P.T.. This is not what the region stated when it updated the policy document in 1986:-

"The Region has been appointing a Principal Teacher in Computer Studies provided that the 40 hours requirement ... is achieved in the school timetable." (66)

The only written 'justification' for the anomaly which I could find was in a copy of the Minutes for a meeting between SSTA members and the Directorate in September 1988 which states:-

".... some schools had only an APT in charge of computing despite having justification for a P.T. The Senior Assistant Director advised ... that the staffing review had explicitly changed the criteria for the establishment of P.T. posts. The situation would be assessed when the staffing review was completed." (67)

For whatever reason it appears that the Region seems reluctant to follow its own published guidelines and appoint Principal Teachers.

This reluctance seems to be extended to the appointment of a Regional Adviser too because the HMI report of 1986 states:-

"At the time of the survey, six authorities had advisers in computing, two had staff tutors and one (Fife) a C.D.O." (68)

Perhaps if the Regional co-ordinator was upgraded to adviser status the P.T.'s upgrading would also follow. (This in fact may now be happening since the whole advisory service in Fife is currently under review.)

It is perhaps unfortunate that Fife Region chooses to base these P.T. appointments solely on the hours being taught within the computing department. I believe that the role of the person in the P.T. post is changing and will continue to change as the nature of school computing changes.

JJ Wellington (1989) suggests that Information Technology in schools is evolving from a vertical (subject based structure) to a horizontal (cross-curricular) approach.

He sees IT in schools as having five stages which are as follows:-

"Stage 1 Computer Studies as an examination subject: rapid rise in entries. 'Vertical' approach to IT.

Stage 2 Computer Awareness across the board to all ability ranges and both sexes with an element of I/S for staff as well as pupils

Stage 3 Introduction of computers across the curriculum in separate subjects to enhance learning in these areas - ie CAL across the curriculum.

Stage 4 Increasing pressure on Computer Studies as a separate subject and on the computer room as a resource for the whole school.

Stage 5 Integration of computing and computing resources into the whole curriculum and classroom practice. 'Horizontal' approach to IT education." (69)

As part of this evolution the post of the IT specialist (or Computer Studies teacher) is also changing. From being a subject pioneer he is becoming a provider of in-service training. If Wellington's stage 3 is to be reached, the specialist will also have to provide technical support for other staff, also suggesting and evaluating suitable cross-curricular software. As Wellington continues:-

"This triple role of technician, in-service training and software provider cannot be sustained by one individual unless he is given the time and the freedom to do it. Without the provision of co-ordination and support for IT education, stage 5 is unlikely to be attained." (70)

It is difficult to see how such a role could be fulfilled by a promoted teacher who is not given both the time and status which it requires.

4.3 Computer Rooms

At the time of this survey (December 1988) most computers within Fife secondary schools were sited in a central 'computer room'. I have therefore concentrated here on these specialised rooms. The number of specialised computer rooms seems to be in keeping with the National norm. The HMI document states:-
"... most schools have two computer rooms and some with a third planned..."[71]

This is however ahead of the Fife prediction mentioned above which stated:-

"Regional policy will be to standardise on .. BBC .. systems .. so that minimum holdings in a secondary school will comprise ... 10 x BBC model B systems.." [49]

Indeed it is also out of step with Fife's own revised document which states:-

"This level of provision (10 basic BBC computer systems) is currently sufficient to meet the demands of a large comprehensive school offering a full range of courses together with an 'across the curriculum' service to all departments." [72]

From comments made by the majority of schools on their questionnaires, it seems apparent that 10 systems is far from adequate provision and would not be sufficient for the needs of the computing department alone, without considering the rest of the school.

The 'National Plan' (SCET document) was slightly closer to what now exists with its prediction of three purpose-built rooms, although if the 'needs' referred to in Chapter 1 are to be met even this level of provision is not adequate in the larger schools. [39]

Although one might expect the split-site schools to have the highest number of rooms due to their own peculiar circumstances, this is not the case. Although one of these schools (M) has four rooms (2 ready: 2 coming on-line this session) the other three split-sites have 2,2 and 3. The number of rooms a school has does not seem to relate to its number of pupils. Since we have school H with only 940 pupils claiming 4 rooms while school G with 1100 pupils has only 1; and school D, with 1696 has only 2. In fact, school N, the biggest in the Region with 1735 pupils has only 2 rooms at present, with a third scheduled for some time later this year.

The criterion for achieving extra accommodation seem vague. Perhaps the courses being run within the school have some bearing on it but school H has fewer than the highest number of hours being taught. The answer must therefore lie elsewhere. Possibly the interests and enthusiasms of the individual rectors come into play. Whatever the reason there is considerable variation in the accommodation provision throughout the region.

If however, as I suggested above, schools are moving more towards a 'horizontal' IT strategy it could be that in the long term some de-centralisation of these facilities would be desirable, but if the demands for computer courses currently shown by pupils in Scotland, are to be met (see Chapter 1), 'computer rooms' *per se* will be required for some time to come, thus continuing to 'tie up' resources in a central point.

4.4 Computer Department

The next section of the results - Table 3 and Table 3A - look in detail at what happens within the Computer Department. The types of course which could be taught by the computer department are shown in this table. Occasionally a school had a group running which did not fit any of these categories (eg O-Grade course in S6).

In this case the time allocated to it was shown under another heading (eg S4). There seems to be six main types of course which could be offered in Fife schools.

Some sort of S1/2 familiarisation is required. This can possibly be rationalised by the schools as follows. Pupils come up to secondary school having had various amounts of 'hands on' computing in their primary school. They have high expectations of the courses which are going to be available to them. In addition, as mentioned in Chapter 1, one of the suggestions of the Bellis reports (1972) was for just such a course, although when the report was written microcomputers did not exist in their present form and so it seems likely he envisaged a different type of course.

All schools in the region with one exception (school J) appear to agree with this and have courses of varying types on offer. The courses themselves generally last for 30-40 hours on a one period per week basis. The time allocations in Table 3 vary from 1040 minutes (17 hours 20 mins) to 'none' with an average of 535 minutes (8 hours 55 minutes) per week due to the different numbers of sections in the various schools. The content of the course is not formally standardised throughout the region but courses are generally based on the recommendations of the MCC report of 1983, [73] usually with the addition of some form of programming skills.

The majority of schools in the region give computing a priority in S1/2 although it only appears in the 'Enrichment' phase (not the 'Core') of the 1987 CCC document on Curriculum Guidelines. [74]

It is likely that schools see this as the 'awareness' type of course referred to in Chapter 1 although whether the courses fulfil Watts definition is impossible to assess since, as I have said, there is no standardisation. It is however significant that these courses appear in S1 or S2 since this ensures that they are a compulsory part of every child's education. Returning to the point made by Roszak in Chapter 1, it seems likely that these courses will have to undergo constant updating due to improvements in technology and eventually the need for such a course may cease to exist since its requirements will both be lessened considerably (because of the technology improvements) and met elsewhere (as computers continue to permeate other subject disciplines).

The next two columns in the table look at Certificate Computing courses in S3 and S4. These results are quite mixed but show that most schools have a substantial commitment in this area.

They vary from school O with one set in S3 and one in S4 to school I with four sets in S3 and five in S4. In many cases the demand exists among pupils for more sets (my own school for instance had 120 pupils competing for 80 places) and these numbers could rise further if more accommodation and hardware become available. The courses themselves are either O-Grade or Standard Grade with all current S3 pupils now on S-Grade courses. This was prompted by a circular from the region in March 1987 requesting how many schools would be prepared to start S-Grade Computing in August of that year.[75] The final result of which was that the bulk of schools commenced S-Grade at S3 in August 1988.

As mentioned in Chapter 1, I have doubts about the real educational value of some of the content of the Standard Grade course, however the demand among the pupils for some course at that level is undeniable and until some alternative is found, S-grade is all we have. It is also of interest to note that although demand is high in Scotland there is now in fact a decline in the popularity of Computing studies *per se* in England. Leaton (1989) quotes examination entry numbers of 120,764 in 1985 falling to 83,131 by 1988 - a 31% decrease. (He suggests [76] the main reason for this is the lack of qualified teaching staff and the staffing in Fife is looked at later).

Higher Grade

The fourth column was intended to show that no schools in the Region have been able to offer 'H'-Grade Computing this session. This was not due to lack of interest since several schools expressed a desire to attempt this new course (at a meeting between P.T.'s Computing and Advisory staff June 1988).

The Region however was not prepared to fund any Higher Computing in schools during 1988/9 despite the fact most other regions were doing so. In fact there are 666 candidates for the first presentation of 'H'-Grade Computing Studies from a total of 78 centres drawn from the following regions and districts:- Highland, Grampian, Tayside, Lothian, Borders, Shetland, Ayr, Argyll, Dunbarton, Glasgow and Lanark (information from papers issued by S.E.B. to 'H' grade moderators in April 1989). Fife Region is one of the very few not present. The situation for next year is still somewhat uncertain but looks a little more optimistic with the possibility of some 6 schools being offered the hardware necessary for the course although at this time (24.3.89) no decision has yet been taken as to whether or not the Region will provide funding (meeting between P.T.'s Computing and C.D.O. Computing March 1989).

Returning to the 'needs' mentioned in Chapter 1, it appears most schools have gone at least someway to satisfying the first of these - the need for an 'awareness' course. As regards the 'further study in Computing' there is a shortfall here both in terms of the numbers of pupils able to take up existing courses and the ability of schools to offer the new Higher Grade. The problem in the first case is one of hardware and time-tabling.

It may well be possible to solve it by adding extra computer rooms or extra staff, however this will only serve to exacerbate the problems in the third area - cross-curricular needs - so perhaps another solution needs to be found. In the case of the H-grade if Fife region does not want to be unique among other Scottish regions in not offering such a course it must supply the resources both in terms of hardware and teacher-training forth-with.

4.5 SCOTVEC Module Provision

The column headed '16+' was intended to find out the impact of SCOTVEC modular courses on Computing in schools. The uptake of these has been high. This is possibly due to the frustration in pupils and staff at the lack of any other suitable course for that age group. In fact all schools but 2 (M and O) offered at least one group the chance to study a module and one school (school K) had 6 groups studying various modules this session. As mentioned in chapter 3, it seemed appropriate to investigate the modular courses in greater detail since this was the only area where schools were free to choose the courses they offered. The survey was designed not just to look at the courses presently being offered but also at those which had been in the past and those which would be in the immediate future.

Fife's approach to the introduction of computer modules seems to have been somewhat haphazard. It appears that schools were, from 1984, able to offer almost any computing module which they felt capable of running.

As stated in the results section, the general trend is to offer 'Introductory' modules to S5/6 pupils such as:-

Introduction to Computers	1091	
Introduction to Computer Software		1093
Introduction to Computer Applications		1095
Introduction to Computer Programming	1111	

The only module which is offered in more than 9 schools and is not in this category is Computer Graphics - 1110 - for which the entrance requirements recommend that some computing has been studied previously, but states that this is optional. In other words it too can be seen as 'Introductory'.

This seems to me to be surprising since there now must be ever-increasing numbers of pupils in Fife schools who have successfully completed an O-Grade or S-Grade course, who cannot as yet attempt a Higher Grade, and who are looking for more computing. This is certainly the case in my school.

The problem is that no advice has been offered on which modules to tackle. There are no 'Computer Module Steering Groups' as exist in other regions (notably Lothian). As has so often been the case in Fife computing, each school is working in isolation. Even the sharing of past experiences in this field is limited. There has been a short series of Modular workshops in May 1988 with two hours devoted to each of 4 modules but these were mainly spent looking at assessments, not at teaching methodology and not at which modules a school might offer.

At no time has advice been offered to schools regarding which modules they should tackle, for which pupils, and how these should be organised. The result,

as has been the case so often before in Fife, is that people are duplicating one anothers efforts and not making use of shared experiences.

What tends to happen therefore is that each school taking on modules for the first time looks at the one which sounds the simplest - namely 'Introduction to Computing' - and as can be seen from table 3A most schools have or do offer this. Not I believe, because it is the 'most appropriate' but simply because it sounds the easiest to teach. The present situation could be much further advanced if the region had only issued some guidelines and suggestions.

As I mentioned above this is one area where computer teachers have autonomy about the courses being taught.

Because of this in the long term it could be that a change in emphasis from S-Grade courses in S3/4 to modular courses in S5/6 (or even in S3/4) would better suit pupils needs.

If suitable modules could be found to adequately cover the computing skills which pupils are likely to require the pupils themselves would have much more flexibility in choosing a course comprised of what they wanted rather than what was prescribed by the SED. Since these courses are only 40 hours in duration this might also serve to ease the demand on the bulk of the computer resources available in the school and allow for more 'cross-curricular' use. It may also be possible here to change the emphasis on school computing from an 'applications' approach to a more investigative one. It is possible for any teacher to write a module descriptor and submit it for approval (in complete contrast to the rigorous prescription of the SEB courses currently on offer) and already module descriptors in areas of Artificial Intelligence and Prolog programming have been written.

4.6 T.V.E.I.

Returning to Table 3, the next column shows the TVEI courses which affect the Computing Department.

The Fife computer element of TVEI is called 'Silicon Society' and at present it is on offer in eight schools. This figure will rise to 19 next session when the last phase of TVEI starts within Fife Region. Thus the teaching load of many Computing Departments is likely to rise much further.

The majority of schools have so far chosen not to integrate 'Silicon Society' into other courses or throughout departments as the philosophy of TVEI would suggest but rather to deliver it as a 'new' course under the auspices of the Computer Department. This may of course change in the light of experience but is the 'simplest solution' generally adopted at this moment in time.

It seems to me to be an outdated approach and one which is fundamentally wrong, for the following reason: it should be possible to merge the philosophies and methodologies suggested in TVEI into the existing curriculum without having 'extra add-ons'. It also seems apparent that any IT element of TVEI must be short-lived and flexible. As mentioned in Chapter 1 the ever-improving technology and its increasing effect on the everyday lives of pupils should make the course, at least in its present form, redundant within a short time span. JJ Wellington (1989) found that then majority of teachers he surveyed also go along with this idea and quotes such comments as:-

"..when TVEI finishes then I hope the IT element will also die, so that it would spread to be a part of other departments." (77)

He continues to quote instances of where other subjects are already using IT:-

"..the English department teaches word processing, History and Geography use spreadsheets and simulations, and Economics does simulations and database work."

(78)

Despite 5 years spend 'piloting' TVEI perhaps Fife needs to look again at its implementation.

4.7 Total department Hours

The total number of hours/mins taught by each Computer Department is shown in the next column. This has been commented on already in relation to promoted posts but one or two other points are worth making.

Firstly school O appears to be out of phase with the others having only 8 hours 50 mins total department time as opposed to the next lowest (schools J and P) with 22 hours. There appears to be no obvious explanation for this, except perhaps that the present incumbent of the A.P.T. post is a relatively inexperienced, young teacher who is still attending a two-year course to qualify as a computing teacher. It is possible he feels he will be in a better position for expansion when he has finished this course. In general the total hours seem to be related to school size, as one would expect, with the bigger schools having the largest department hours. However the job is very similar no matter the size of the school and it is my opinion that there should be a person of Principal Teacher level in every school in the Region, regardless of the hours taught, as 'Technology consultant', across- curricular adviser and all the other jobs which fall to the 'computer expert'.

Indeed it could be here that the future of the 'computer teacher' as such lies.

As schools move from the vertical approach of teaching IT to a more horizontal one (as mentioned in section 4.2) the computer expert within the school is likely to become more and more of a consultant to other staff. JJ Wellington (1989)

describes this post as that of a "roving computer consultant" [79] but points out the possible problems this might cause with other staff who could view it as 'empire building'.

In view of this he suggests that the post of IT co-ordinator might best be at depute head level, (or with the same reasoning, I would suggest at A.H.T. level).

4.8 Qualified Staff

The total number of teaching staff in the region who are currently qualified in - or taking qualifications in - computing is 48. This ranges from three schools with one staff member to one school (K) with 6. Again perhaps ironically the school with 6 has an A.P.T. running the department. This high figure is not the norm and most schools have only one or two - not enough to meet school-demands in many cases. This appears to reflect a nationwide shortage. The annual statistics from the S.E.D. on 'Excess and Deficit of Secondary School Teachers By Subject' [80] show that of all secondary school subjects at this moment in time Computing has the highest deficiency with a shortage of 16 full time teachers in 1987 (the only other subjects showing a deficit being Business Studies (-9), R.E.(-4) and Physics (-3). The bulletin goes on to show that Fife Region itself has a shortage of 3 Computing teachers out of a teaching complement of 1690. [81]

The S.E.D. recognise this problem and to some extent have tried to alleviate it with the contents of SED circular 1153 (1987) which continues the offer of 75% specific grants to education authorities to provide In-Service course in computing and computing applications.

However despite all this Fife have not yet, to my knowledge, appointed anyone as a 'Teacher of Computing'; only 'computing plus another subject'. One step forward has been that Colleges Of Education such as Moray House now offer a TQ in computing as a single subject [82] : until recently it could only be taken as a second subject. Having said this however, the bulk of qualified computing teachers achieved their qualification as a supplementary one: in other words they were already teaching another subject in a secondary school. The S.E.D. in a statistical bulletin dated November 1988 show that only one student successfully completed a pre-service course with computing as a main subject as compared with 128 in mathematics. [83]

The post-service numbers, on the other hand, are a different matter,as can be seen from Table 6.

Table 6: Numbers of Teachers on courses for Computing T.Q. at Teacher Training Colleges 1983-1988

	Moray House Bearsden		Jordanhill	
Date	**2-wk T.Q.**	**DPSE**	**I.S.**	**T.Q.**
1983	18	–	28	--
1984	11	14	30	--
1985	17	15	40	--
1986	22	21	59	--
1987	22	19	50	11
1988	18	20	21	18

(84,85,86)

(Although details were requested from other colleges these were the only ones which were forth-coming). They show that significant numbers of teachers are still re-training in computing. As expected from teacher distribution throughout Scotland large numbers of these are in the Strathclyde area. Thus, with 48 qualified personnel, Fife seems to be relatively well off in its numbers of computer-department teaching staff, and this may be a contributory factor as to why Fife has not undergone the decline of pupil numbers mentioned by Leaton in Chapter 1.

4.9 Technician Time

The final column in this table looks at the Technician time allocated to computer-related duties. The majority of schools received little technician help with most (14) getting less than 40 mins per week. Again this reflected a national trend. The HMI report states:-

"In most schools there was no allocation of technician time to support the use of computers: in the few where staff made a contribution they played an important role"

(87)

This did not appear to be the choice of the technicians. The few I spoke to were keen to become involved but felt they lacked both the time and the expertise to make a significant contribution. The chief technician in school N explained that he had only received one computer related training course (lasting one and a half days) in the last 5 years. The problem itself is only going to become more acute, as the transformation from a vertical to horizontal IT approach described in Chapter 1 gradually progresses.

At the moment the bulk of the teachers using computers in schools are 'computerate' ie have some working knowledge of the hardware which they are using.

If the computer is ever to become widely established, and 'non-experts' are to make significant use of it then some-one will have to take on the role of trouble-shooter. The solution here seems to lie with the HMI's suggestion:-

"The range and scale of technician/auxiliary support should be reviewed and consideration given to ways in which that support might be organised and related to other needs." (88)

If P.T.'s / A.P.T.'s are to be released from time-consuming mundane duties such as copying discs and setting up / trouble shooting hardware a large increase in Technician help is essential.

4.10 Other Departments

As I indicated in Chapter 1 it is perhaps here that the real potential for 'computers in education' lies. Of the three areas suggested by Drage and Evans (Chapter 1) it is within other departments that learning with computers and using computers as tools are probably most valuable. Here I intend to comment on the position within Fife schools and how it compares with the National one.

Table 4 in the results contains two surveys in one, since both pupil use (eg Computer Aided Learning) and staff use (word-processing work-sheets etc) are looked at. By way of a comparison two other such surveys are also considered. Neither of these differentiates between staff and pupil use and neither is very up-to-date, and although I understand that the results of a similar survey are

soon to be released by the D.E.S. they are not available at this time (March 1989).

The two sets of results which were available are given below. One of these (S.C.E.T.) is based on a survey of Scottish schools and the other (D.E.S.), on schools in England. In addition the table contains my own results converted to a percentage, for comparison. In order to achieve parity I have included only my 'pupil' results in here.

Table 7 : Use of Micros in the various Departments of Scottish & English Schools : 1985,1984 & 1989

Subject	% of schools using micros in these departments		
	SCET(1984)	DES(1985)	Mine(1989)
Mathematics 54	67	79	
Computer Studies	--	58	100
Geography	23	38	--
Physics	52	27	--
Craft & Technology	--	36	68
Chemistry	38	32	--
History	--	23	--
Biology	30	22	--
Business Studies	51	29	95
Mod. Languages	--	14	31
Home Economics	--	12	79
Music	--	8	5
Art	--	5	31
Remedial	24	--	--
English	21	25	52
Science	--	--	89
Soc. Science		--	-- 63

(89,90)

In view of the different ways the above data is presented it is difficult to draw direct comparisons. However certain facts do stand out. Firstly more secondary

school departments are now involved in using computers than ever before. In the SCET survey for example the Arts subjects had little mention with only subjects like English and Geography having any entry.

The DES survey was marginally better with results such as Art 5%. My own survey shows a massive increase in computer use across all subjects and in fact a change in emphasis too. Whereas before subjects such as Mathematics and Science boasted the highest figures, subjects such as Business Studies, Home Economics and Craft and Technology are taking over. One of the main catalysts for this change would seem to be the H.M.I. report referred to already. [58] In their review of that report the Scottish Educational Journal states:-

"The report correctly emphasises that the ultimate aim is the use by all teachers of the microcomputer as a teaching tool with the subsequent enrichment of the curriculum for the pupil." [91]

Indeed the report goes further as reported in 'The Scotsman':-

"There is an urgent need for Education Authorities and schools to promote the use of microcomputers ..(this is because)..pupils generally take a more positive attitude to learning when they use micro-computers in the class-room" [92]

So the HMI report has pressurised the regions for an increase in across curricular use. This in turn has been reflected by advisory staff who are actively encouraging (in terms of both hardware and software provision) the use of computers within their own specialist areas.

It is perhaps also worth looking at why this change in emphasis has been necessary.

Why it was that until very recently the general impression was that computing was all about mathematics and science and therefore could only be of use within these areas.

At least part of the blame would appear to lie with one of the Government funded programmes, which although English based appears to have had an effect on Scotland too. The Microelectronics Education Programme (MEP) set up in 1980 in its original strategy paper published in April 1981 states:-

"The aim of the programme is to help schools to prepare children for life in a society in which devices and systems based on microelectronics are commonplace and pervasive." (93)

The problem with this is that R. Fothergill the director, decided to approach the problem in two ways. The first of these covered investigating the most appropriate ways of using the computer for teaching and learning but with particular emphasis on science and mathematics.

I believe that as a direct result of this, computer facilities were concentrated in these departments (as can be seen above) thus allowing other areas such as humanities to gain little from the introduction of computing. In many ways this has been unfortunate since it is this latter group of subjects which can have the greatest educational benefit from the new technology. In Scotland, the final report of the Consultative Committee on the Curriculum's (CCC) Microelectronics, Computing and the Curriculum Project (MCC) published in 1984 (94) lists initiatives in many other subjects including Art, Business Subjects, English, Modern Languages, Social subjects and Music.

Despite this fact however computers had apparently become the province of Mathematics and Science in many Scottish schools (certainly this was the case from my own experience) and it is only recently that this image has started to change.

Another effect of this linking of computing to mathematics has been to discourage girls from taking Computing as a subject. Indeed as Celia Weston of the British Computer Society states:-

"...the automatic linking of maths to computing has done damage that could take another ten years to undo." (95)

Her comments are based on information in the same article which states that:-

"The proportion of girl entrants to professional and technician grade careers in information technology has halved in the last six years." (96)

She further suggests that many of the current shortages in these areas could be filled if women entered these professions at the same rate as in America and France.

Returning to my own results. From these it can be seen that some schools in general terms, have a more 'computer-aware' staff than others. For instance school J has very few departments making use of computers. In order to investigate this further I had included some questions on Staff In Service, Use of computer room by other departments, and reasons for non-use by staff. The results of these are also given in Table 4 and show that 16 of the 19 schools have some form of computer awareness course for staff. Ten schools take this further and also teach some Word-Processing to interested staff but three schools offer nothing.

Once again this appears to have been left to the discretion of the individual rector or Computer P.T./A.P.T. . Perhaps a policy statement by the region would have helped here. In fact I believe the best approach may be to produce a Fife Region Staff hand-book along with some policy decisions for encouraging non-specialist staff to use computer resources. This has happened in a few individual schools but a regional approach would be better than the present piecemeal one.

The penultimate column in this table shows that where staff did not make use of computer provision two main reasons were given. Both lack of hardware, and lack of interest/motivation are cited as reasons. The latter may be helped as I have suggested above by a regional initiative, the former will be looked at later.

Finally in this table, the use of the computer room(s) by other staff. Ten schools had non-computer classes in these rooms for more than 120 mins per week. This is an encouraging sign but is obviously limited by the time available within these rooms. Some priority of access really needs to be worked out as to who has precedence and when. This comes back to issue of the need for a policy statement within every school as mentioned earlier. This could in fact suggest a radical change in emphasis and approach, since as I have touched on earlier, there is hardware in the school but at the moment it is tied up most of the time with computing classes, teaching courses of dubious value. Because of the problems associated with hardware access and the fact that classes are on occasion 'taken en masse' to the computer room, I would suggest that where these departments are making use of computers they are, for the most part using a C.A.L. approach.

While this can be very worthwhile for reasons mentioned in Chapter 1, as already argued, it is as an information processing tool that the computer may be of most value. To be used as such it has to become as familiar in the class-room as any other resource and the pupil has to be as confident in its use. Realistically, to enable this to happen a computer in every class-room is required and it could be that the future lies in this direction. If this necessitates a decrease or even abolition of certificate computing courses then perhaps this should be considered.

J

J Wellington (1989) sites at least one school which has seen a growth in 'computing' as a subject but has now effectively stopped teaching it:-

"We are dropping Computer Studies as an examinable subject - concentrating on IT, with a firm commitment to spread IT across the curriculum." (97)

He sees the reasons for this trend as being:-

"... the majority of school teachers are aiming to make computing resources available to all subjects. This is inhibited by the existance of separate Computer Studies.. courses." (98)

If Fife Region is unable to fund the extra hardware any other way, it should perhaps consider a shift of emphasis towards a more 'horizontal' approach to IT with a spreading of resources throughout other departments.

4.11 Hardware

One of the most important factors influencing the rise of computing in Fife schools and the one which is referred to in all of my 'needs' in Chapter 1, is the numbers of computers held by each school.

These are summarized in Table 5. As can be seen there is a wide variation in numbers of computers throughout the region, although all schools have standardised on BBC micros in line with Regional Policy (99). This is also in line with the National trend mainly due to the D.T.I. scheme mentioned in Chapter 1.

As Nick Evans states:-

"Schools bought them (BBC micros) in their thousands until the situation that now prevails came into being - 70 per cent of schools in the country standardising on the BBC Micro-computer". (100)

It would seem to be logical that the bigger a school is in terms of pupil numbers, the greater its hardware provision should be. Following this to a logical conclusion therefore school N - the largest in the region - should have the most computers. This however is not the case.

In fact school 'N' fairs poorly in terms of raw numbers of computers and in fact has the poorest pupil : computer ratio in the region (1:28) along with school F which is the third largest. This pupil:computer ratio is referred to by JJ.Wellington (1986) as the Computer Access Factor. In his survey he quotes a range of CAF in schools from 7 to 148 with the bulk of schools falling between 20 and 70 and a median CAF of 44. So by comparison the Fife schools fare well.[101]

The school with the best provision is in fact school 'L'. This is to some extent understandable because although not the largest school it is certainly the newest. School 'L' has been open for less than two years and is regarded by some as the 'flagship' of Fife Secondary schools. It therefore received substantial funding for computer hardware when built and now boasts the best pupil : computer ratio in the region (1:9). It is difficult to establish the criteria used for distribution of hardware throughout the other schools.

There are many factors, including T.V.E.I. pilot schools (schools A,G and H) which received considerable extra hardware from M.S.C. funding, and split site schools (C,D,K, and M) which have two separate buildings to provide and therefore need more machines. Whatever the reasons, at first glance the provision looks good.

The pupil : computer ratios shown are higher than those suggested by the National Plan (see Chapter 2) and even those quoted by the Minister for Education Mr Kenneth Baker in a recent report [102].

However both of these sources tend to be talking about machines available for cross-curricular use (as explicitly stated in the Fife 1986 policy document above) although this is not made clear. If provision for this factor is allowed a different picture emerges.

Taking school 'N' for example, which has 62 computers, the 17 Amstrad P.C.'s (which only arrived in September 1988) are for Business Studies use and therefore the majority of pupils are unlikely to use them (therefore subtract 17). Of the BBC Masters/Model B's, 30 are computer department based and due to time-table restriction cannot really be accessed by other staff to any great extent (subtract another 30).

This leaves a school figure of 15 Master computers (of which 6 only arrived during session 1988/9), which gives what is perhaps a more realistic ratio of 1 computer per 115 pupils, and the situation is similar in other schools.

Even looking at the provision for the computer department - of the thirty computers based there, 10 arrived only this year and these were not bought by Fife region but were S.E.D. funded as part of a cash input for Standard Grade phase 2 subjects.

£100,000 being the global sum for the development of Standard Grade computing in Fife Secondary schools. Although the region is now starting to put more machines into schools there is still a long way to go to reach 'adequate' provision.

Apart from a change of policy and funding from Fife region,there seem to be two steps which may help the situation. One is to re-define the priorities of computing in Fife Secondary schools, giving precedence to cross-curricular use instead of computer department use. This would be a difficult step to take since

enthusiasm among pupils for specialist computer courses is high and continuing to rise.

As mentioned above, my own school for instance had 120 pupil names for 80 places in the current S3. However as I have already intimated the educational value of some of these courses is in my opinion, suspect and if a 'cross-curricular' approach were properly implemented it would remove many of the justifications for such courses.

The second possibility is to follow Mr Kenneth Baker -The Minister for Education's suggestions. Returning to the article mentioned above he suggests that industry should be encouraged to provide computer hardware for schools. Indeed as the article states:-

"Mr Baker told a CBI conference that the Government was spending £30 million a year on computers and teacher training. He (Mr Baker) praised private enterprise for schemes like Letchworth where industry is putting £2 million into six secondary schools." (103)

Indeed Mr Baker continues to suggest:-

"I am quite convinced that unless and until every secondary school in this country has strong permanent links with local business community we will be at an international disadvantage" (104)

W.Norton-Grubb (1984) disagrees with this approach however. One of his criticisms of the vocational significance of IT is:-

"An over-emphasis on the vocational function of schooling '..the short-term appeal of vocationalism is irresistible but the long-run consequences may be unfortunate.'" (105)

Even if Mr. Baker is correct, this seems to be a long term plan which will not help Fife in the immediate future. There is however still other funding which could influence the situation. As the Times Educational Supplement (Scotland) reports:-

"Scottish schools are to be given more than £300,000 to help install computers for the new technologically based courses at Standard Grade and Higher. The grants come from the Department of Trade and Industry." (106)

Perhaps this money will offset some of the shortfall.

4.12 Networks

Looking at the other items in Table 5 shows that only 6 schools have networks planned or installed. Two of these are actually being purchased this financial year. This is in contrast to the intention mentioned in the Region's own document:-

"During the next three years (from 1986) ... as well as increasing the holdings of basic systems ... network systems will be introduced in the larger schools."(107)

Of the six in table 5, three were paid for by M.S.C. under the TVEI scheme and one is in the new school - 'L'. So in actual terms the money spent by the region installing networks has been minimal. This may in part be due to a lack of conviction in some as to the value of a school Network. JJ Wellington (1989) has evidence to suggest that the presence of a network system is detrimental to CAL:-

".. schools with networking facilities were less likely to be using CAL across the curriculum.. evidence from the survey serves to support this." (108)

I believe however that this is only if the network is incorrectly used. If properly used a reliable network can facilitate the use of CAL throughout a school. It can also be used as a communications medium with programs such as `SCHOOLFAX` (from New College, Swindon) which can automatically download pages from CEEFAX and ORACLE each day and display them on all stations , as well as allowing for user-created pages for in-house information. Obviously if the network is only extended to cover one or two rooms (`computer rooms`) it is not being utilised to its full potential, allowing access for only very few pupils.

This is the rather limited view Fife have taken in the schools where networks have been installed.

It is a decision which, in my opinion, has been short-sighted and is one which misses a real opportunity for greatly enhanced inter-communication.

I believe the ideal situation to be stand-alone machines with network capability. This would allow users the best of both worlds but obviously has severe cost implications. The other factor which must be considered is the staffing. As Drage and Evans (1988) state:-

"It is certainly important to have a network manager who not only has the ability to undertake all the necessary work on the equipment but is also given the required time as well. This person needs to be a teacher... and be available to help staff... to get the best from their system." (109)

Therein could lie another reason for Fife`s reluctance to promote network systems. Since they are apparently unwilling even to appoint P.T.`s computing, it seems highly unlikely that they will appoint a network manager too.

4.13 S.C.A.M.P.

The SCAMP column of Table 5 shows that all 19 secondary schools now have a computer administration system installed. This has been a fairly recent event as the system had until last year only been on pilot in a few schools. However a large influx of cash from the Region means it is now into all schools, suggesting that the region agree with my statement in Chapter 1 regarding the benefits of computers to school administration.

4.14 Viewdata

Finally the last column gives an indication of the VIEWDATA services available in each school. Some 11 schools now have access to PRESTEL and three to TTNS. NERIS is available in nine schools but six still have no VIEWDATA provision. Those schools which do have PRESTEL provision were provided with this by sources outwith the region eg TVEI funding or as a National pilot school. Despite the fact that VIEWDATA is a necessary requirement of 'O'-Grade Computer Studies which has been on offer in my own school since 1985 we are still unable to access PRESTEL. The region will not provide funding or permission for this, even though the Department of Trade and Industry offered a free MODEM to all secondary schools as long ago as 1985. These were not distributed to Fife schools but stored centrally, and I can find no written reason for this. The situation has been resolved some-what only this year when a letter was issued to secondary schools from Martin Stewart - Assistant Director of Education, in which he brought to the attention of rectors a new D.T.I. scheme where the DTI would:-

"..meet the cost of installation plus the first quarter's rental of a telephone line dedicated to access 'value added data services'" (110)

Only after the issue of this letter and written requests from individual rectors to the Region, were the MODEMS released. So, many schools still do not have PRESTEL but at least they now have a MODEM. This can perhaps be put in perspective a little bit better by looking at another region's provision. Tayside not only have MODEMS in all schools but also pay subscriptions for them on TTNS. Indeed the Region now uses 'Electronic Mail Boxes' for many of its official communications.

This is one area where Fife appears to be reluctant to proceed, the main stumbling block apparently being the on-going costs of subscriptions and

telephone bills. It appears the entire area of communication both inter- and intra-establishment requires some attention.

Summary

In summary thus far it appears that the 'needs' referred to in Chapter 1 are being catered for to some extent in Fife Region's secondary schools. Most schools have an 'Awareness Course' although the content of these is not centrally prescribed. Certificate computing is catered for in all schools but there are not sufficient resources to meet demands. The alternatives appear to be to increase these resources or to reduce the demand perhaps by ensuring that what the pupils are looking for is met elsewhere. The third category is where the major shortfall appears to be. Although computers are now in use throughout most departments, in the majority this is only to a limited extent. To gain more of the potential benefits of the new technology will require an increase in hardware, in-service training (both to alter attitudes among staff and to give them practical capabilities), and perhaps also a change in philosophy; with a move towards a more horizontal presentation of Information Technology.

Chapter 5

The Future

5.1 Future Hardware

If an attempt is to be made to alleviate the shortfall in the two areas referred to in Chapter 4 then a large increase in hardware purchase will be necessary. Therein however, lies a new dilemma: what computer systems to buy. There are two main reasons for this problem. One of the these is that the BBC Model B and its successor the Master are nearing the end of their lifetimes. The Model B is no longer produced and Acorn have hinted that production of the Master will not continue indefinitely. Schools, or more correctly Fife Region, will therefore eventually have to decide on a machine to replace it, both for increasing the level of provision and for replacing worn out systems. The second reason is that the newer technology of the 16- and 32-bit machines offers more facilities in terms of speed, graphics etc. and also more compatibility with industry standards. In fact the DTI is also encouraging the purchase of the newer technology machines by offering money for their purchase.

"£4 million has been allocated to local education authorities (England and Wales) to spend on 16- and 32-bit computers and peripherals." (111)

Several documents exist which could be considered when taking a decision on future hardware provision. The first of these is the DES document New Technology for Better Schools (112) which contains appendices offering considerable advice on the purchase of microcomputer systems.

This covers areas such as "ports and interfaces, printers, modems, MIDI, and control devices".(113) There is also a comparison chart compiled by the Council for Educational Technology (CET) in collaboration with equipment manufacturers which gives a detailed breakdown of the facilities offered by the various machines.

SCET have also produced an update to their National Plan document - A SCET Strategy To Support Microcomputers In Scottish Schools (114)- published in February this year, which contains some valid points. Lastly The Times Educational Supplement carried out their own survey of opinions on various microcomputers which was published in their issue of 17.3.89(115)

The new SCET strategy document states that "two main categories of use are envisaged - Teaching about Computers and Teaching with Computers."(116) The first of these will require machines to run "industry standard" software. This is increasingly needed for courses such as SCOTVEC modules, H Grade Computing and in the near future H Grade Technological Studies and CSYS Computing Studies. The SCET document comments thus :-

"Over the next five years it is likely that the greatest numbers of new machines will be purchased to support such use (H Grade etc). There will also be a greater turnover of machines to support these courses because the normal lifetime of equipment in industry is rather shorter than that in education." (117)

The last point here is of particular significance to schools. What has happened to date is that reasonable sums of money have been provided (by Government etc) on a 'one-off' basis but it seems likely that in future a steady flow of funding will be more appropriate.

The position is then, that machines are required for two specific purposes - teaching about computers and teaching with computers. It is possible that these two areas may conflict as far as the most appropriate computer is concerned but I would suggest that for many reasons including finance and compatability Fife remain with the Master where at all possible but purchase new technology for areas of the curriculum where the existing technology will not suffice. It is not the purpose of this paper to determine future hardware provison but I would suggest that considerable research had been carried out in this field and could be taken into account when making decisions on future policy.

I believe it is time that teachers changed their outlook and asked themselves not 'What is available for the Master?' but rather 'What do I want to achieve? What software exists for this purpose? (and) What machine shall I run it on?' What seems more likely however is that teachers will have to continue to 'make do' with what they have.

Machines could possibly be redirected for cross-curricular use from Computer Studies departments as they are replaced by newer systems (or even if a change of emphasis and priority is indicated).

This also follows logically from a statement in the SCET document:-

"It is very likely that there will be great pressure to re-equip at least one of the BBC based computer rooms with equipment of a different type to meet ... the needs of new courses." (118)

However, I believe if the real value of computers in education is to be realised it will require both a large input in funding and a change in philosophy at a regional or even national level.

The introduction of new technology into schools is a process that requires much more consideration than it appears to have had in Fife. There are certain key questions which could and should be asked about the most effective way of utilising this technology. Some of these are quoted in an extract from The Microtechnology Report (an MEP sponsored document) published by RESOURCE) and cover such areas as:-

"
Which areas of the school will benefit most by the introduction of new technology immediately?

Who are the key teachers with an enthusiasm for I.T. who can transmit it to others?

What is the best method of equipment distribution - a computer room, a network, or stand alone systems?

What changes are likely to take place in the curriculum, teaching methods, class-room or school organisation if a cross-curricular approach is adopted?

Will the school continuously evaluate the use of I.T. across the curriculum? How will it be monitored and by whom? "(119)

There is no written evidence that Fife have considered these issues at school level or even at a regional one. I believe there also needs to be a clear statement of the educational goals which the region is seeking to achieve with its use of computers. This is to some extent implicit in their policy document but should be made much more explicit.

5.2 Summary and Suggestions

In this section I have tried to summarise most of the criticisms made previously. In addition, where possible, I have made some suggestions as to how improvements could possibly be made. Some of the issues raised are paralleled in a recent document released by the Department of Education and Science referred to in Chapter 5. In July 1987 a letter was sent by DES to all LEA's in England and Wales headed "New Technology for Better Schools"(112). In this letter the DES laid out its 'Strategy' for improving the provision of Information Technology in all schools. Many of the issues referred to in this document are mentioned in my own conclusions.

a) In line with regional policy, all schools should produce some form of document regarding Computing policy within the secondary school (see section 4.1). In order to ensure that this is completed and also to have an 'overview' of the whole region, completed copies of this document could be collated by the Curriculum Development Officer for computing. An updated statement of the region's own policy statement would also be of value here. The original statement was written in 1984 and although revised in 1986 the new version was

never distributed to schools. It seems time for another revision but this time with full distribution.

The DES document actually went further with the matter in England stating that each LEA must submit

> "a statement of the Authority's development policy over the coming 5 years....to be lodged with the Secretary of state by 31 December 1987" (120)

b) The anomaly regarding the Principal Teacher/Assistant Principal Teacher-Computing posts must be resolved with some expediency (see 4.2), if the subject is to gain full credibility in all schools. This will also help the post-holder carry out his/her duties effectively since there are occasions (when dealing with other subject P.T.'s for example) where the A.P.T. computing is at a distinct disadvantage. In addition to this an A.H.T. needs to be given a remit which covers all other aspects of Information Technology within the school. (In some schools this post already exists as a small part of an A.H.T.'s role. I believe however there is a case for it becoming a much more substantive post.) It would also be beneficial if the post-holder had considerable expertise as regards Information Technology and its implications for education.

It may also help if an Adviser in Computing was appointed (in line with other Regions) with the possibility of short-term secondees (as C.D.O.'s) for completion of specific tasks (eg implementation of Higher Grade).

Once again looking at the situation in England reveals that "advisory teachers with specialisms spanning the curriculum to co-ordinate and promote I.T. in their own and related specialisms." (121) should be appointed.

To some extent the subject advisers perform this role in Fife but I believe they do not go far enough. Perhaps more training for them in IT relating to their own specialisms would initiate a 'cascade' effect throughout the region.

c) If computers are to remain centrally based all schools should have at least two fully-equipped computer-rooms: bigger schools may in fact need three (see 4.3). This is an attempt to satisfy not just the growing needs of the computing department but also the increasing demands of cross-curricular usage.

d) Some standardisation of SCOTVEC module provision needs to be achieved. This is not to 'tie schools down' or stifle initiative, but merely to share experiences and spread existing expertise (see 4.5). This may be accomplished by some form of working party. In addition the whole area of module provision could be reviewed to test the feasibility of offering more (open and relevant) modular type courses and less (restrictive) S.E.B. prescribed ones.

e) If computer departments as such are to be the norm, the region needs to think more in terms of specific computer department personnel rather than merely 'borrowing' interested parties from other departments (see 4.8). This would avoid the problems of 'split-

loyalties' at parents nights and during In-service days. Computing teachers, as such, could (and should) be appointed, again helping to raise the credibility of the subject, but also recruiting more 'consultancy' expertise for cross-curricular provision.

f) At least one technician in every school requires training to become 'computerate' both as an aid to first line maintenance and to enable them to take on tasks such as disc formatting / copying, system assembling / trouble-shooting etc. (see 4.9).

All these jobs at present have to be dealt with by the P.T. / A.P.T. computing which they need not be if anyone else could do them.

Further, time needs to be allocated in each school for technicians to be able to perform these functions (say 1 day / week or equivalent initially). This problem is also recognised by the DES who state the need for technicians as being

> "to ensure the maintenance of hardware, to set up in classes and carry out general technical functions relating to both hardware and software in order to free teachers from technical tasks for which few will be well-equipped..thus allowing them (teachers) to concentrate on .. the pedagogical applications of the technology" (122)

which is the role I envisaged in Chapter 4.

g) Some programme of general computer-awareness for all staff needs to be initiated at a regional level in order to bring the 'slower' schools in line with the remainder (see 4.10). A regional policy statement on this may carry more weight and uniformity than efforts of individual rectors and advisers. Such a course need not be taught at regional level - it could all be handled 'in house' by computer department staff - but the lead, and perhaps also the time, need to come from above.

Again this need is recognised by DES who state that in-service teacher training is needed..

"to give all teachers at a least a basic familiarity with the potential uses of IT in their specialism and to ensure that at least one (teacher) per department has more substantial up-to-date training in the potential uses of IT in their specialisms."(123)

There is obviously a tie-in here with the 'advisory teachers' mentioned above but I feel that the DES document goes a long way towards addressing many of the 'problem areas' which I have revealed in Fife.

h) In addition to g) above, large numbers of 'extra' computer systems are needed in schools for cross-curricular use (see 4.11). It seems unfair to stifle the enthusiasm for computing as a subject simply to gain machines for elsewhere but if the recommendations of the H.M.I.'s are to be implemented and some of the potential benefits of computers exploited then an increase in machine time for other departments must be found from somewhere.

This could perhaps form part of an 'up-grading scheme' (see above) where new 16-bit machines are introduced into certain areas thus releasing the BBC B's and Masters for elsewhere. Once again this need is recognised by DES who state:-

"and - crucially - hardware sufficient to make ready and frequent access a reality for all pupils."(124)

They do not define how many systems are required for 'ready and frequent access' but Evans suggests a minimum of "one computer

per teaching class room" (125). Fife certainly does not have this number but then neither do any other regions. However some move towards it should be seen as a priority.

i) Depending on the policy decisions made in a) interested schools (probably about eight) should be equipped immediately with sufficient hardware to meet the demands of 'Higher' Grade Computing (see 4.4). The remaining schools (about eleven) should receive similar hardware from next year's budget.

In addition to this some immediate in-service training for teaching staff is also needed in this area. In the short term it need not involve other personnel to any great extent, since both the material and some expertise already exist within the region if only provision were made to share it.

In the long term more substantial in-service is required in this area. Ideally a course, at university of at least three months duration is needed but in all practicality this is never likely to happen so some other (cheaper) alternative needs to be considered eg distance learning.

j) A programme for introducing networks into schools should be initiated as soon as possible (as is stated in regional policy documents). This should encompass not just the computer department but cabling should extend throughout the school. Obviously finance will be a major problem here therefore all schools could not be equipped at once. However, some form of long term rolling programme needs to be initiated (say over 5 years) and

adhered to. Although a major expense a correctly used network could greatly improve communications within schools. However to oversee its usage extra personnel would also be required: at the very least at regional level but possibly also at schools level.

k) It appears that the advent of TVEI will ensure that all schools have MODEMs and VIEWDATA facilities (see 4.14). It is however still 'too little too late'. A much higher profile of electronic mail within the region should be considered. Perhaps the use of such for official communications would encourage this. It would certainly be faster and possibly more reliable than existing methods.

Schools should also be able to communicate electronically with other schools and to be able to send software backwards and forwards by telephone. Again perhaps this needs some regional initiative with (say) a short term C.D.O. appointed to oversee its implementation.

l) It seems that if schools are to fully exploit the potential educational benefits of new technology then a radical change of approach is required. I do not want to 'do away with' computing departments but feel that their role is evolving towards a consultancy one. More appropriate course could be offered by our exisitng computing departments but much of their current input, in courses such as 'computer awareness' could easily and be taught elsewhere (possibly more effectively). This would need both a change in attitude (by both computing staff and staff in the other departments)

and an education of those other staff in the applications of new technology to their subjects.

5.3 Possible Extensions Of This Dissertation

I have tried here to give a factual and accurate report of computing in Fife Secondary schools. Several logical extensions of this work come to mind in order that it may be viewed comparatively.

1. A similar in-depth survey of another Scottish region could be carried out to elicit how computing has developed there in comparison to Fife.

2. A survey of an English Region would give a comparison with the rest of the U.K. or perhaps even a different European country for a more global picture.

3. A survey of the Fife primary sector would give an overview of regional educational computing provision.

On a different level, it may also prove worthwhile to evaluate what has actually been achieved in educational computing in the last decade. Has computing become 'just another subject' - Layton's stage 3 - or has something worthwhile been achieved. If not, is it ever likely to or do we need to revise our opinions of what is plausible? A programme of ethnographic interviews (with pupils and teachers) or action research with teachers may answer these questions.

Appendix I

First letter to Fife Region

Queen Anne High School
Dunfermline
Fife
KY12 0PQ
28.10.88

re:- K.Thompson:-M.Ed. Dissertation Questionnaire

Dear Sir,

As you are aware I am currently in my third year of a part time M.Ed course at Stirling University. Earlier this year you and I talked informally about my intended Dissertation topic, and since then I have confirmed my intentions with Stirling University staff and now wish to go ahead with my research.

I am therefore writing formally to request permission to send a copy of the enclosed questionnaire to each Secondary school head-teacher, for completion by the teacher in charge of Computer Studies.

Most of the questions are fairly 'neutral' and none should give you cause for concern! If you wish to alter any however, or perhaps even add some of your own please feel free to do so.

At our initial meeting in June you also expressed a willingness to meet with me and give the Region's views on Computing in Fife schools. If you are still willing to do so perhaps you could suggest a time we might meet. A thursday afternoon would be best if at all possible. You will see the general area I am interested in from my questions.

Yours faithfully

K.Thompson P.T. Computer Studies

Appendix II

The Questionnaire

The school

1) Please state the approximate number of pupils on the school roll._____

2) Is there a written school computer policy?_____
(If so, a copy would be greatly appreciated)

3) What post does the teacher in charge of school-computing hold?

Tick one

Principal teacher

Assistant Principal Teacher

Other (please state) _____

4) How many purpose-built computing rooms/word processing rooms does the school have?
____ / _____

The Computer Department

5) For each of the following Computing-class groups please give the approximate allocation of teaching time per week (in minutes) during the current session. If none, write '0'

	number of sections	time each
S1/2 Computer Appreciation	_____	_____
S3 O-Grade /S-Grade	_____	_____
S4 O-Grade /S-Grade	_____	_____
S5/6 H-Grade	_____	_____
S5/6 16+ Modules	_____	_____

Computer-related TVEI _____ _____

Other (please state) _____ _____

6) How many teachers within the school are currently qualified/obtaining qualifications in Computing? _____

7) On average, how often does the Computer Department receive technician support?

Tick one

More than 80 mins per week

40-80 mins per week

Less than 40 mins per week

Never

Other Departments

8) Is training available for other staff in any of the following areas?

Please tick

General 'computer-familiarisation'

Word-processing / D.T.P.

Computerised Department Administration

If so, who organises/runs it? _____

9) Which of the following departments make use of computers within the school?

Please tick

	staff use	pupil use		staff use	pupil use
English			Modern Languages		
Mathematics			Home Economics		
Science			Social Science		
Technical			Business Studies		
Music			Art		

Other (please state)_____

If any of these have their own Computer provision please mark with a 'C'and the number of systems (eg C3).

10) On average, how often is/are the computer rooms(s) used by classes of non-computer department staff?

Tick one

More than 120 mins per week

40-120 mins per week

Less than 40 mins per week

Never

11) In the case of departments who make little or no use of computers which of the following is the most important reason?

Please tick

Lack of suitable hardware / access time

Lack of interest

Lack of suitable software

Hardware

12) How many of each of the the following computer systems are currently being used in your school:-?

a) BBC B or MASTER _____

b) RML 380Z _____

c) Amstrad PC _____

d) Other (specify) _____

13) If any of the above types of computer are no longer used on a regular basis (less than 1 hr/week) please mark with a cross (X).

14) Are any of the school computer systems on a local area network?_____

15) Does your school have access to any of the following?

Please tick

a) Prestel

b) TTNS

c) Neris

16) Does your school currently have S.C.A.M.P. installed?_____

Many thanks for your time and effort and please feel free to add any comments below.

Appendix III

Letter To Schools

Queen Anne High School
Dunfermline
Fife
KY12 0PQ
4.12.88

Dear Headteacher,

I am P.T. Computer Studies at the above school and am currently in my third year of an M.Ed course at Stirling University. As the final part of said course I am completing a dissertation on 'The state of Computing in Fife Secondary schools.'
I have already approached the Region, in the person of Mr. Hill and have received permission to approach each secondary head teacher for some help.

I would therefore be most grateful if you would find the time to complete the enclosed questionnaire. It could be that Mr. XXXX, whom I understand has the responsibility for computers in the school would be the best person to answer most questions but you may feel you wish to contribute yourself.

I assure you that all results will be confidential and the school name will not appear.

I thank you in anticipation of a reply.

Yours faithfully

K.Thompson

References

1) Shervan-Shreiber, J-J (n.d.) — The World Challenge. Simon and Schuster from The Mitsubishi Report

2) Eggleston,J (1977) — The Sociology of the Curriculum London: Routledge Kegan Paul p.130

3) Evans,N (1986) — The Future of the Computer in Schools London: MacMillan Education: p.163

4) Drage,C Evans,N (1988) — Teacher Friendly A Guide to Using Micros in the Classroom Cambridge: Learning Development Aids p.17

5) Statz,T (1974) — Training Secondary School Computer Science Educators in Topics in Instructional Computing - 1 p.5

6) S.E.D. (1987) — Standard Grade Arrangements Edinburgh:HMSO p.7

7) S.E.D. (1987) — Higher Grade Arrangements Edinburgh:HMSO p.4

8) Wellington,JJ (1989) — Education for Employment The Place of Information Technology Windsor: NFER Nelson: p.233

9) Schostak,JF (Editor) (1988) — Breaking Into the Curriculum The Impact of I.T. on Schooling London: Methuen: p.25

10) Schostak,JF (1988) — Op cit 9 :p.87

11) Schostak,JF (1988) — ibid 9

12) Schostak,JF (1988) — op cit 9 :p.71

13) Bork,A (Terry,C Ed.) (1984) — Using Mircocomputers in Schools Kent: Croom Helm: p.9

14) Bork,A (1984) — op cit 13: p.13

15) Bork,A — ibid 14

(1984)

16) Bork,A (1984) — ibid 14

17) Wood (Vincent,B/T Eds) (1985) — Information technology and F.E. London: Kogan Page: p.108

18) Evans,N (1986) — op. cit 3: p.56

19) Evans,N (1986) — op. cit 3: p.64

20) Bernstein,B (1967) — Open Schools Open Society from New Society

21) John,D — Leadership In Schools Heineman: p.13

22) Atherton,R et al (1977) — Microprocessors In Secondary Education in Computer Education - 27: p.17

23) Woodhouse,D McDougall,A (1986) — Computers Promise and Challenge in Education Melbourne: Blackwell Scientific Pubs: p.162

24) Adams,A Jones,E (1983) — Teaching Humanities in the Electronic Age Milton Keynes: O.U.P.: p.28

25) Adams,A Jones,E (1983) — op.cit 24: p.32

26) Evans,N (1986) — op.cit 3: p.3

27) Adams,A Jones,E (1983) — op.cit 24: p.4

28) Norton-Grubb,W (1984)
The Bandwagon Once More: Vocational Preparation for High-Tech Occupations Harvard Educational Review ,54,4 Nov 1984: p.451

29) S.C.E.T. (1985)
Microcomputers in Scottish Schools A National Plan Glasgow: S.M.D.P.: p.13

30) Watt, D.H. (1980)
Computer Literacy: What should schools be doing about it? Classroom Computer News 1: p.26-27

31) Roszak,T (1986)
The Cult of Information The Folklore of Computers and the True Art of Thinking Cambridge: Lutterworth Press: p.50

32) Terry,C (1984)
Using Microcomputers in Schools Kent: Croom Helm: p.3

33) Layton,D (1972)
Science As General Education; T rends in Education

34) D.E.S. S.E.D. M.E.N.I. (1967)
Computer Education. Report of an Interdepartmental group London: H.M.S.O.

35) S.E.D. (1969)
Curriculum Paper 6 Computers and the Schools. Interim Report. p.4 Edinburgh: H.M.S.O.

36) S.E.D. (1969)
ibid. 35: p.9

37) S.E.D. (1972)
Curriculum Paper 11 Computers and the Schools. Final Report. Edinburgh: H.M.S.O.

38) S.E.D. (1969)
op. cit. 35: p.6

39) S.C.E.T. (1985)
op. cit. 29: p.12

40) Odor,P and Entwistle,N (1982)
The Introduction of Microelectronics into Scottish Education Research Reports for Teachers Edinburgh: Scottish Academic Press

41) S.C.E.T. (1985a) — Computing and Microelectronics in Scottish Education: An Overview Glasgow: S.M.D.P.: Pamphlet P.2

42) D.O.I. (n.d.) — Information Technology: Micros In Primary Schools Leaflet

43) P.S.C. for M.C.C. Project (1984) — Final report of Project Steering Committee Dundee: S.C.D.S.: p.6

44) I.C.L. (1982) — Computer Education in Schools Newsletter No. 40

45) S.E.D. (1987) — Higher Grade Computing Discussion Document Edinburgh: H.M.S.O.

46) Woodhouse,D McDougall,A (1986) — op. cit. 23 : p.162

47) C.C.C. (1987) — Curriculum Design for the Secondary Stages Guidelines for Headteachers Edinburgh: H.M.S.O.: Appx I/II

48) Wellington,JJ (1989) — op.cit 8: p.75

49) Fife Regional Council Education Committee (1984) — Microcomputers in Schools A Report on Provision and Developments: Fife Educational Resources Centre

50) F.R.C.E.C. (1984) — op. cit. 49 p.2

51) F.R.C.E.C. (1984) — ibid. 49

52) Taylor,B.K. (1989) — Letter to author from C.D.O. Computing (23/2/89)

53) Fife Regional Council Education Committee (1986) — Microcomputers in Schools A Report on Provision and Developments: Fife Educational Resources Centre

54) S.C.E.T. (1985) — ibid. 39

55) S.C.E.T. (1985) — op. cit. 29 : p.23

56) S.C.E.T. (1985) — op. cit. 29 : p.51

57) F.R.C.E.C. (1986) — op. cit. 53 : p.3

58) S.E.D. (1987) — Learning and Teaching in Scottish Secondary Schools: The use of Microcomputers Edinburgh: H.M.S.O.

59) F.R.C.E.C. — op. cit. 49 : p.3

60) S.E.D. — op. cit. 58 : p.76

61) Glenwood H.S. (1987/8) — Committee Report and Policy Statement for Computers across the Curriculum p.1

62) S.E.D. — op. cit. 58 : p.28

63) Burdett,FJ (1987) — Local Education Authority Policies for Computers in Education in Journal of C.A.L. , 3 p.30

64) Burdett,FJ (1987) — op.cit 63: p.37

65) F.R.C.E.C. — op. cit. 49: p.3

66) F.R.C.E.C. — op. cit. 53: p.4

67) F.R.C. (1988) — Minutes of Meeting between Fife Director of Education and S.S.T.A. on 22/09/88 in Rothesay House

68) S.E.D. — op. cit. 58 : p.18

69) Wellington,JJ (1989) — op.cit 8: p.44

70) Wellington,JJ (1989) — op.cit 8: p.45

71) S.E.D. — op. cit. 58: p.20

72) F.R.C.E.C. — op. cit. 53: p.4

73) M.C.C. for C.C.C. (1983) — Computer Education Guidelines for Courses in S1/2 Dundee College of Education

74) C.C.C. (1987) — op. cit. 47

75) F.R.C. (1987) — Circular to Secondary Schools 4/2/DWH/JM 19/3/1987

76) Leaton,E (1989) — The Great Computer Crash in The Times Educational Supplement 6:1:89: p.22

77) Wellington,JJ (1989) — op.cit 8: p.65

78) Wellington,JJ (1989) — ibid 77

79) Wellington,JJ (1989) — ibid 77

80) S.E.D. (1988) — Statistics Bulletin No.3/C1/1988 Table 1

81) S.E.D. (1988) — ibid. 80 : Table 2

82) Jenkins,D (1989) — Letter to author from Dr.D Jenkins Registrar - Moray House ADM/GRAD/KD : 21/02/1989

83) S.E.D. (1988) — Statistics Bulletin No.10/G1/1988 November 1988: Table 4

84) Jenkins,D (1989) — Letter to author from Dr.D Jenkins Registrar - Moray House ADM/DJ/KM : 20/02/1989

85) Kilgariff,J D (1989) — Letter to author from J.D.Kilgariff Registrar - Jordanhill College JDK/CMcG : 09/03/1989

86) McDonald,S (1989) — Letter to author from S.McDonald Computing Dept. - St. Andrews College 22/02/89

87) S.E.D. (1987) — op. cit. 58: p.33

88) S.E.D. (1987) — op. cit. 58: p.68

89) S.C.E.T. (1985) — op. cit. 41: p.3

90) D.E.S. (1986) — Statistical Bulletin: Results of Survey of Microcomputers in Schools: Autumn 1985: Table 15 London: H.M.S.O.

91) E.I.S. (1988) — Learing and Teaching in Scottish Secondary Schools: H.M.I.'s Scottish Educational Journal 19/02/1988: p.3

92) McLean,A (1987) — Computers pass test with pupils The Scotsman: 12/10/1987: p.5

93) D.E.S.
W.O.
D.E.N.I.
(1981)
Microelectronics Education Programme:
The Strategy
Honeypot Lane: p.1

94) C.C.C.
(1984)
Microelectronics, Computing
and the Curriculum
Final Report of the P.S.C.
Dundee

95) Weston,C
(1989)
Computing Jobs are Changing their nature...
The Guardian: 14/03/1989: p.40

96) Weston,C
(1989)
ibid. 95

97) Wellington,JJ
(1989)
op.cit. 8: p.75

98) Wellington,JJ
(1989)
op.cit. 8 :p.66

99) F.R.C.E.C.
(1984)
ibid. 49

100) Evans,N
(1986)
op. cit. 3: p.104

101) Wellington,JJ
(1989)
op.cit. 8: p.70

102) Meikle,J
(1988)
Help Our Schools Buy Computers..
The Daily Mail: 16/04/1988: p.19

103) Meikle,J
(1988)
ibid. 102

104) Meikle,J
(1988)
ibid. 102

105) Norton-Grubb,W
(1984)
ibid 28

106) T.E.S.
(1989)
DTI Grants
The Times Educational Supplement
17/02/89: p.A3

107) F.R.C.E.C (1986) — op. cit. 53 : p.3

108) Wellington,JJ (1989) — op.cit. 8:p.73

109) Drage,C Evans,N (1988) — op. cit. 4: p.50

110) Stewart,M (1988) — Memo to schools from M.Stewart-Asst. Director of Education 60/2/MS/VC : 28/08/1988

111) Educational Computing (1989) — DTI gives out £4 million Educational Computing London: Redwood Pubs April 1989 p.9

112) D.E.S. (1987) — New Technology for Better Schools London: H.M.S.O.

113) D.E.S. (1987) — ibid. 112 : p.9-12

114) S.C.E.T. (1989) — A SCET Strategy To Support Microcomputers In Scottish Schools Glasgow : SCET January 1989

115) T.E.S. (1989) — Computer Survey The Times Educational Supplement 17/03/89: p.B26

116) S.C.E.T. (1989) — op. cit. 114 : p.1

117) S.C.E.T. (1989) — op. cit. 114 : p.2

118) S.C.E.T. (1989) — op. cit. 114 : p.6

119) M.E.P. (1987) — Acorn User Dec.1987 London: Redwood p.171

120) D.E.S. (1987) — op. cit. 112 : p.5

121) D.E.S. (1987) op. cit. 112 : p.2

122) D.E.S. (1987) op. cit. 112 : pp.2/3

123) D.E.S. (1987) op. cit. 112 : p.2

124) D.E.S. (1987) op. cit. 112 : p.3

125) Evans, N. (1986) op. cit. 3 : p.57