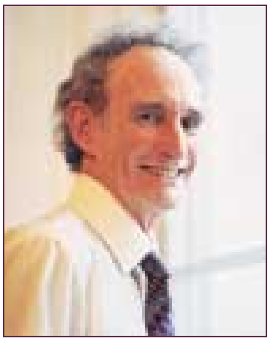
THE ROYAL SOCIETY

The Association for Science Education

Survey of science technicians in schools and colleges

Foreword

Lord May of Oxford, President of the Royal Society and
Professor Patrick Dowling, President of the Association for Science Education



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Technicians in schools and colleges have a vital role to play in the provision of high quality science education. But, if they are to play this role to the full, all technicians must be supported in their work and accorded the professional status they deserve.

This joint ASE / Royal Society report gives the results of a wide-ranging survey of technicians conducted during 2000. The picture it paints of technician conditions is, at best, one of huge variation. Whilst it is true that some technicians enjoy excellent working conditions, the depressing fact is that many technicians working in schools and colleges feel their role is misunderstood and undervalued.

Technicians want meaningful job descriptions which are allied to a clear career structure. They want improved access to (and funding for) continuing professional development. These are things which every professional surely has a right to expect.

This report is the first of two from the joint ASE / Royal Society working group on technicians which has been established under the chairmanship of Sir John Horlock. We wish to express our gratitude to Sir John and the members of the working group for the time and effort they have already committed to this project. We also look forward to their second report, to be published later this year, which will contain the group's recommendations for actions to strengthen technician provision in schools and colleges.

We commend this report to policy makers in national and local government, headteachers and principals, governors, heads of science and all others with an interest in ensuring UK science education fully realises its potential.

Survey of science technicians in schools and colleges

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Summary

In 2000, the Association for Science Education (ASE) and the Royal Society sent a questionnaire to technicians at 4859 UK schools and colleges with the aim of exploring the variety of duties carried out by technicians and to investigate their conditions of service.

Completed questionnaires were received from 1917 schools and colleges and from 5026 individual technicians. The survey thus yielded a unique database of information concerning the provision, roles, responsibilities, working conditions and opinions of laboratory technicians in secondary schools and colleges. A joint ASE / Royal Society working group has been established under the chairmanship of Sir John Horlock to review the survey findings and to make recommendations based upon them. This report – the first of two – gives the main findings of the survey. In summary, these are:

Provision, working environment and conditions

- The number of technicians per science lesson is lowest in comprehensive schools compared to other types of schools. In grammar and independent schools, technicians work with fewer pupils while servicing comparable numbers of laboratories to colleagues in comprehensive schools.
- The number of technicians per science lesson is lower in Wales and Northern Ireland than in England. Scotland also has fewer technicians per science lesson than England, although this is influenced by the fact that class sizes in Scotland are limited to a maximum of 20 (leading to more lessons each week).
- Working conditions for technicians are extremely varied. Some work alone, others are members of a team. 64% of institutions surveyed had science laboratories on a single site, 29% were on two sites, 7% were on three sites and 56% had laboratories on different floors, all of which present manual handling difficulties.
- Technicians suggest that breaks during the day are often difficult to take because of pressure of work and that working conditions (eg space and ventilation) in preparation rooms are given little consideration.

Job descriptions

- Whilst four-fifths of technicians surveyed have job descriptions, many say these are not entirely relevant, are often out of date and are rarely updated.
- Technicians support a range of age groups, Key Stages, qualifications and science subjects. The extent of this range contributes to the demands on a technician.
- In addition to their 'traditional' duties, skills required by technicians due to the introduction of new technologies appear to be growing.
- Technicians want meaningful job descriptions which are allied to a clear career structure, perhaps built around nationally recommended 'core' job descriptions and linked to National Occupational Standards and Technical Certificates.

Recruitment, career progression and training

- The ratio of female to male technicians is 3:1 and the age profile of technicians is skewed towards the older group, with 72% being over 40, and 8% being under 30.
- Young people are not being recruited into schools and colleges as technicians.
- Many technicians enjoy their work and find it satisfying, often mentioning the fact that they help students to realise their potential. However, many are disillusioned because of their inability to progress as they gain experience and qualifications. A coherent career structure is lacking.
- There is a general perception among technicians that school senior management does not understand the job of a technician and consequently does not value it.
- Whilst over 60% of technicians surveyed were aware of the S/NVQ qualification for science technicians in education, less than 11% were working towards it. Two reasons were cited for the low uptake: a lack of centres offering the qualification and the difficulty of obtaining funding for the accreditation process.
- Over 60% of technicians surveyed have attended health and safety training courses, although for a third of these this training was more than 3 years ago.

A second report, to be published later this year, will give the conclusions of the working group and recommendations for action. We therefore welcome comments on issues which the survey findings raise. These should be sent in the first instance to the Education Manager, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG;
email: education@royalsoc.ac.uk

1 Introduction

1.1 Background

Everyone actively involved in science education recognises the central role played by school and college science technicians in the provision of high-quality education. Yet surprisingly little work has been undertaken to establish any kind of profile of the technician workforce. In 2000, the ASE and Royal Society sent a questionnaire to technicians at over 4800 UK schools and colleges. The aim of the questionnaire was to explore the variety of duties carried out by technicians and investigate their conditions of service and salary scales.

Completed questionnaires were received from over 1900 schools and colleges and from more than 5000 individual technicians – a huge response for a survey of this kind. The survey thus yielded a unique database of information concerning the provision, roles, responsibilities, working conditions and opinions of laboratory technicians in secondary schools and colleges. A joint ASE / Royal Society working group has been established under the chairmanship of Sir John Horlock to review the survey findings and to make recommendations based upon them. The membership of this group is given in Appendix 1.

In this report – the first of two – we give an analysis of the main findings of the survey. The questionnaires also provided individual technicians with an opportunity to comment openly or offer suggestions, and representative comments are included (in italics) in relevant sections of the report. To help put the survey findings into context we have also included, in Appendix 2, twelve case studies outlining how technician support is currently being used in a selection of schools and colleges. A second report, to be published later this year, will give the conclusions of the working group and recommendations for action. We therefore welcome your comments on issues which the survey findings raise. These should be sent in the first instance to Nigel Thomas, Education Manager, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG; email: education@royalsoc.ac.uk

1.2 Previous work and conduct of survey

In 1990, the ASE published '*Technical support for school science*' which offered guidance to schools on technician provision, a formula to calculate required staffing levels and example job descriptions. Then, in 1992/93, the ASE conducted the first major survey of science technicians and reported its findings in '*Technicians – an Invaluable Asset*' (ASE, 1994). As a result of the recommendations made in that report:

- a new class of Technician Member of the ASE was created, (membership is now in excess of 2000);
- the ASE Laboratory Technicians' Committee was established to offer technicians support and to provide information to relevant bodies about technicians and their work, and;
- the ASE, under the auspices of the Science, Technology and Mathematics Council, managed the development of occupational standards which led to the S/NVQ (Levels 2 and 3) Laboratory Technician Working in Education.

Against this background, in Spring 2000 it was considered timely to undertake a new survey of science technician provision. A questionnaire was sent to 4859 schools and colleges in England, Wales, Scotland and Northern Ireland. It comprised two parts:

- Part A, concerned with information about the school/college and to be completed by the senior technician; and
- Part B, concerned with information about the working conditions of individual technicians.

Completed questionnaires (Part A) were received from 1917 schools and colleges, a 39.5% response rate. Part B responses were received from 5026 technicians. This represents a very high response rate, especially for a questionnaire that required some time to complete and it is clear that the technicians took a great deal of trouble to reply. The time and effort taken by technicians, and the response rate, are, we feel, indicative of the importance which they attach to the survey.

Any survey depends, of course, on the quality of information supplied. When results appeared very unusual or surprising, as many as possible of the technicians in question were contacted and asked about their responses to the questionnaire. Where appropriate the data was adjusted as a result.

2 Provision, working environment and conditions

2.1 Introduction

Three methods of assessing the adequacy of school science technician provision are commonly cited[1]. These are:

a) Comparison against the old 'rule of thumb' of Her Majesty's Inspectorate (HMI) of one technician per three laboratories.

b) Comparison against the National Science Advisers' and Inspectors' Group (NSAIG) 'technician support index' (TSI), defined in a survey of 165 schools across 9 LEAs[2] as:

$$\text{TSI} = \frac{\text{total number of FTE}^{3}\text{ technicians x 100}}{\text{number of pupils on roll}}$$

In the NSAIG survey, the TSI averaged 0.29 in 11-16 schools (range 0.19 to 0.46) and 0.30 in 11-18 schools (range 0.19 to 0.45). No further education colleges were included in the survey.

c) Comparison against the formula published in the 1990 ASE document '*Technical support for school science*', in which a 'service factor' is calculated as:

$$\text{Service factor} = \frac{\text{Technician hours per week}}{\text{Hours of science teaching per week}}$$

Once the service factor has been calculated, the quality of technician function is described by Table 1.

The ASE document also identified special circumstances that required a higher level of technician provision. These included:

- school science departments operating across split sites;
- science departments where accommodation is widely dispersed or on several levels, creating servicing difficulties;
- schools with inadequate laboratory storage necessitating frequent movement of apparatus between laboratories, prep rooms and stores;
- schools with rural science education involving the management of farm livestock and crops especially during weekends and holidays.

Since this ASE document was written, there have been changes in curriculum and service terms of employment. For example, many technicians are now employed on term-time rather than full-time contracts.

It was evident from the replies to our survey that the phrase 'full-time technician' as used in the NSAIG

Table 1

Service factor	Quality of technician function
0.85	*"This is the recommended allocation of technician support to science teaching for a compact suite of laboratories with adjoining preparation and storage space. All functions are feasible including the accessing of training and developing opportunities to meet the schools changing needs".*
0.70	*"At this level of allocation provision of the full range of functions will depend upon recruiting well-qualified and experienced technicians. Where the full range is possible there will be a need to prioritise functions and decide on the emphasis of support required. It may still be possible to achieve a balance between resource related, design & development and direct support activities."*
0.60	*"It will not be possible to deliver all functions adequately and a restricted range of priorities will need to be identified. Efficient management of resources and administration are likely to be affected and activities related to design and development of practical programmes and direct support will be in jeopardy. Functions possible may well depend on the skills and experience available and a policy for training will be essential to maintain the service."*
0.45	*"Functions will be markedly reduced and in most cases no more than simple, immediate maintenance and control will be possible. In the long-term efficiency in these will be impaired. The availability and range of resources will become restricted and the development of effective practical programmes may be impaired. A supervisory structure for the less experienced may have to be provided from elsewhere. Regular training will be essential but difficult to accommodate."*

[1] See, for example, the CLEAPSS publication PS26: 'Calculating the number of science technicians', (CLEAPSS, 1999)

[2] Published in 'Education in Science', (ASE, April 1994)

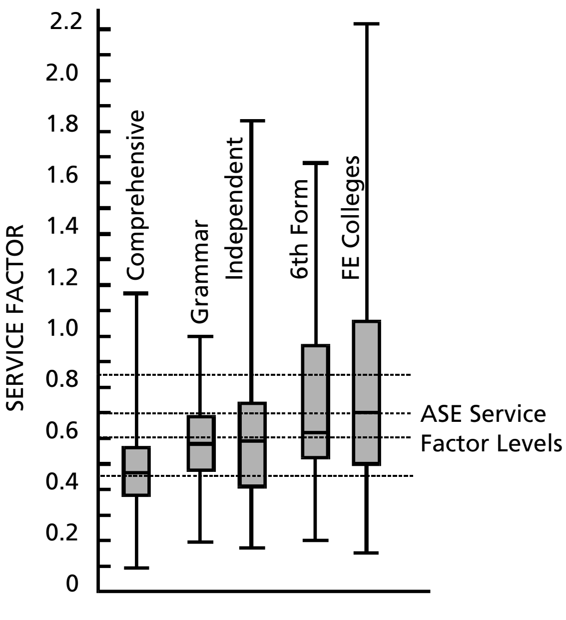
[3] Full time equivalent

equation would cause difficulty, since many technicians working on term-time contracts considered themselves as working 'part-time'. The definition of full-time technician also applies to the HMI formula. In addition, the NSAIG formula is not applicable to further education colleges as many students there do not study science.

Data obtained from our survey concerning technician hours was unambiguous and hence far more reliable. The ASE formula uses technician hours to calculate the service factor and so this was used as the basis of our comparisons of provision across different types of establishments and locations in the country.

2.2 Service factors

Service factors were calculated, using the ASE formula, for five different types of institution: comprehensive schools; grammar schools; independent schools; sixth-form colleges; and further education colleges. They were compared using five-number 'boxplots'. The central box in the boxplot has its ends at the quartiles and hence spans the middle half of the data. The horizontal line within each box marks the median. The vertical lines extend from the boxes to the smallest and largest observations.



Comparison of service factors in different types of institutions.

The four levels of service factor used by the ASE were 0.85, 0.70, 0.60 and 0.45. For grammar and independent schools and sixth form colleges the median was close to 0.60 ("*It will not be possible to deliver all functions adequately*"). With a service factor of median value only slightly above 0.45 it is clear that comprehensive schools have fewer technicians per science lesson than other institutions. This value of 0.45 indicates a level judged by ASE as being where "*Functions will be markedly reduced and in most cases no more than simple, immediate maintenance and control will be possible*".

Extreme values were confirmed by telephone. One senior technician whose school had a service level of over 0.80 wondered how others coped as she found it difficult at times, especially during pupil investigations. She added that the head of department was excellent and that all technicians were involved in the department, including attendance at meetings.

At the other end of the scale, the only technician at a 1000-strong school only stayed working there because there were no other jobs in the area. The head of department was fully supportive, but senior management was less so. The technician felt he could not help the teachers well enough.

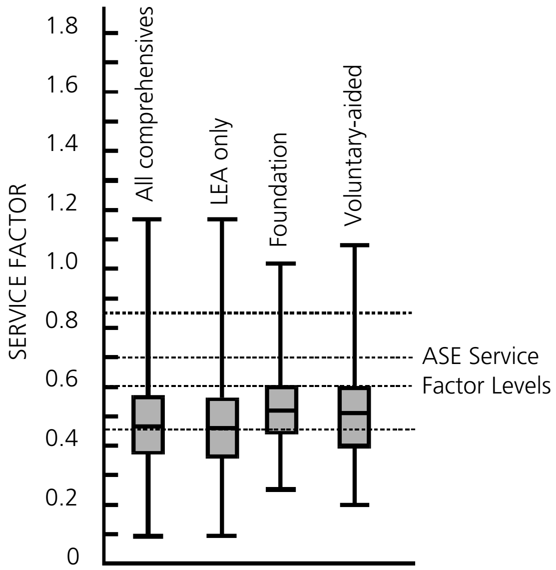
Some schools scored very highly. These were very small country secondary schools, or schools that were closing down and so had a depleted number of year groups. There were a greater number of very high scoring schools in the independent sector.

Many technicians in further education found some questions on the questionnaire difficult to answer, perhaps because they were primarily aimed at schools. These technicians service some classes other than, and possibly beyond, Advanced level. They are also involved in more demonstrating work. Some sixth form colleges and higher colleges use lecture theatres and laboratories in tandem, whereas schools tend to use laboratories for all lessons.

It is tempting to suggest that the ASE service formula is set too high. However, many schools from both the state and private sectors use these guidelines and would not want to see the levels lowered. The ASE believes that they remain meaningful in today's situation. Arguably, there should be greater provision to cope with the increased amount and variety of practical science being taught and the increase in the number of term-time only technician contracts. The ASE service factor assumed that full-time technicians worked all year and not term-time only. Therefore, the 'technician hour per week' was averaged over the whole year and assumed time was available during school holidays to undertake various aspects of their work. This means that the ASE recommended service levels (table 1 on page 3) are too low when applied to schools and colleges using term-time only contracts. The adjustment figure would be 45/37 (number of working weeks in a full-time contract divided by the number of working weeks in a term-time only contract).

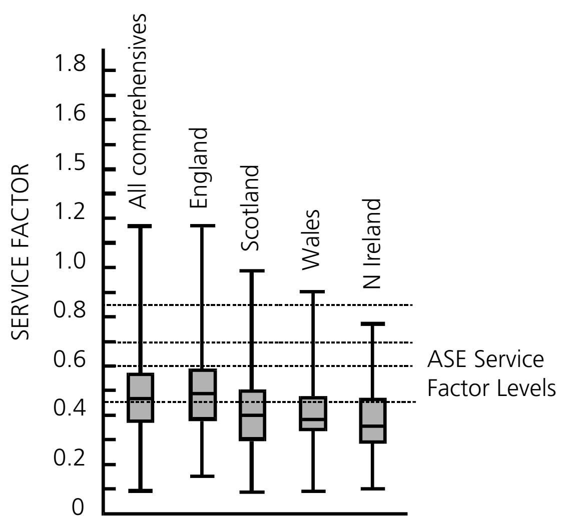
2.3 Comprehensive schools

Service factors in comprehensive schools under different management systems were compared. The results indicate that the level of technician provision is slightly higher in foundation and voluntary-aided schools.



Comparison of service factors in comprehensive schools

The number of technicians per science lesson is higher in England than in Scotland, Wales or Northern Ireland. In Wales and Northern Ireland, more than half of the schools are below the minimum service factor of 0.45 presented in the 1990 ASE report. In Scotland, all science classes are limited to 20 students which means that there are more teaching periods in the school week than in other parts of the UK. Some of the maximum class sizes recorded in places other than Scotland were as high as 35.



Comparison of service factors in comprehensive schools across the UK.

2.4 Working conditions and environment

Working conditions for technicians are extremely varied. Some work alone; others are members of a team with other technicians. Some work in a single building (but service several floors) while others work in a number of buildings, sometimes on different sites.

Data obtained from the survey regarding average school size, number of laboratories and technicians is given in the Tables 2 and 3 on page six.

In grammar and independent schools, technicians work with fewer pupils while servicing comparable numbers of laboratories to colleagues in comprehensive schools. The situation in Scotland shows that in order to accommodate class sizes of 20, there are more laboratories for the technicians to look after. The number of pupils on roll in sixth form and FE colleges is not relevant because many students will not take science at all.

The DFEE Building Bulletin 80[4] makes recommendations about the number and size of laboratories. These depend on number of pupils in the school, their age range, the amount of curriculum time given to science and frequency of use. For a 900-pupil school, the calculated number of laboratories is 5.36-5.90 (assuming a reasonable frequency of use, these are rounded up to 6-7 to allow for a frequency of use not greater than 90%). Based on an analysis of a sample of existing schools, the space recommended for each preparation area is 0.4-0.5 m^2 per workplace. The modern design of laboratory suites has one prep room serving all the laboratories. Only 19% of the schools surveyed had this arrangement.

> *"Labs and classrooms rarely out of use. Prep room too small, not enough work space, space for storing used equipment prior to cleaning or space for storing practicals prepared in advance."*

Apparatus and equipment are also stored in laboratories and this can cause difficulties for technicians.

> *"Most of our storage of equipment is in the laboratories not the prep room so break and lunch hours are spent clearing up and fetching equipment for the preparation of lessons – the only opportunity we have to use the labs. Therefore can only take minimum breaks while working."*

2.5 Location of laboratories

63.8% of institutions surveyed had laboratories on a single site, 27.5% were on two sites and 7.1% were on three sites.

[4] Building Bulletin 80 (Revised 1999): Science Accommodation in Secondary Schools (Architects and Building Branch, Department for Education & Employment)

Table 2

	(A) Mean number of pupils on roll	(B) Mean number of prep rooms	(C) Mean number of labs	Technicians (D) Mean technician hours per week	Technicians (E) No. of FTE technicians*
All schools	900	2.5	7.8	77	2.1
Comprehensive (all)	973	2.5	7.7	75	2.0
in Scotland	877	2.2	9.1	68	1.8
not in Scotland	980	2.5	7.6	76	2.1
Grammar	867	3.4	8.3	97	2.6
Independent	482	2.5	6.9	79	2.1
VI form college	(1044)	2.5	6.8	94	2.5
FE	(1921)	2.3	5.2	88	2.4

* The full-time equivalent (FTE) technician is assumed to work 37 hours a week, so column (E) = (D) / 37

Table 3

	Mean no. of pupils on roll per FTE technician [(A) / (E)]	Mean no. of prep rooms per FTE technician [(B) / (E)]	Mean no. of labs per FTE technician [(C) / (E)]
All schools	430	1.2	3.7
Comprehensive (all)	490	1.3	3.9
in Scotland	490	1.2	5.1
not in Scotland	470	1.2	3.6
Grammar	330	1.3	3.2
Independent	230	1.2	2.9
VI form college	420	1.0	2.7
FE	800	1.0	2.2

43.7% of institutions had laboratories all on the same floor. Of the remainder, those with more than one floor, only 17.9% had lifts or hoists available. Building Bulletin 80 recommends that during refurbishment and for new buildings on different floors, a hoist should be included. It also suggests that any lift provided for disabled access could be used for transporting heavy pieces of equipment such as gas cylinders or computers.

> *"School science department 1½ miles from main site. Labs and prep room upstairs. Science department split between 2 buildings separated by busy residential road. Main prep room and 3 labs purpose built conversions in old junior school. 3 labs and store/prep room in old secondary school. This site is on a hillside. From main prep room there are steps from yard to road, steps from road to other yard, steps from yard to main entrance and chemistry lab, steps from this level to quad and from quad to door leading to physics and biology labs. Buildings are old and dilapidated and frequently vandalised."*

The data shows that the working environment for many technicians is difficult. They are required to move equipment and chemicals between preparation rooms and laboratories that are often in different buildings and on different floors; health and safety issues are obviously raised by this.

The average length of each science-teaching period is 54 minutes with an average of 184 science periods taking place each week, 174 taking place in the laboratories.

2.6 Other issues relating to working conditions

67.0% of technicians surveyed have a lunch break, 64.0% have a morning break and 23.0% have a break in the afternoon. A more detailed analysis is needed to examine the relationship between timing and frequency of breaks and the length of the school or college day. Although the quantitative data shows that most technicians have or are entitled to a morning and lunch break, their comments suggest that in many cases these are not taken because of pressure of time in clearing away and preparing the next lessons.

Less than one-third (31.6%) of technicians surveyed never do overtime. Of those that did, whether regular or occasional, almost one-fifth got neither time off in lieu or extra pay.

There were frequent comments about working conditions in the preparation room, especially in terms of space and ventilation. It was widely felt that this area is easily and regularly ignored. A further concern was the overuse of some laboratories and, therefore, the difficulty of properly servicing them.

> *"Condition of the prep room is appalling – small, cramped, dirty, floor covering lifting, hole in roof which lets in rain – no improvements after years of complaints – but feeling from the authority is 'its only the technicians prep room – its not worth bothering about."*

> *"When science departments are refurbished or updated, very low priority is often given to prep room areas because of a lack of consultation. Hence working conditions are very poor. Working conditions rather than work load is a major issue."*

One technician referred to the effect of Curriculum 2000 on the timetable and a possible increase in science groups. This could exacerbate the problem of being able to provide effective support to the science curriculum. It is essential that the impact on technicians of changes to the curriculum and its effect on laboratory use, class size and servicing requirements are considered and planned for. It is just one more argument for involving technicians in departmental meetings as recommended in '*Safety in science education*', DfEE 1996.

> *"From September 2000 the college timetable will be radically altered to accommodate AS levels. The college day will be increased by 30 minutes and breaks eroded to one break/day (20 min) plus lunch. This will tend to make turnaround time for practicals difficult and without any additional hours must stretch my 30.25 hours/week to fit. In addition we will have an increased number of practicals, another member of teaching staff and an increased number of groups."*

3 Job descriptions

3.1 Introduction

81.4% of technicians surveyed have job descriptions. However, comments indicate that in many cases technicians feel that these descriptions are not entirely relevant, often out of date and rarely updated. In some cases the job descriptions are generic ones used for all non-teaching staff.

> *"It is impossible to tell from our job descriptions that we work in a school. One of the main motivations for me to do this job is the fact that I work with children. I am often put in a position of responsibility regarding children in the lab and around the school campus where quick action is needed. It is a key responsible position to be in but this is not reflected in our job description or our pay."*

3.2 Range of students and curriculum supported

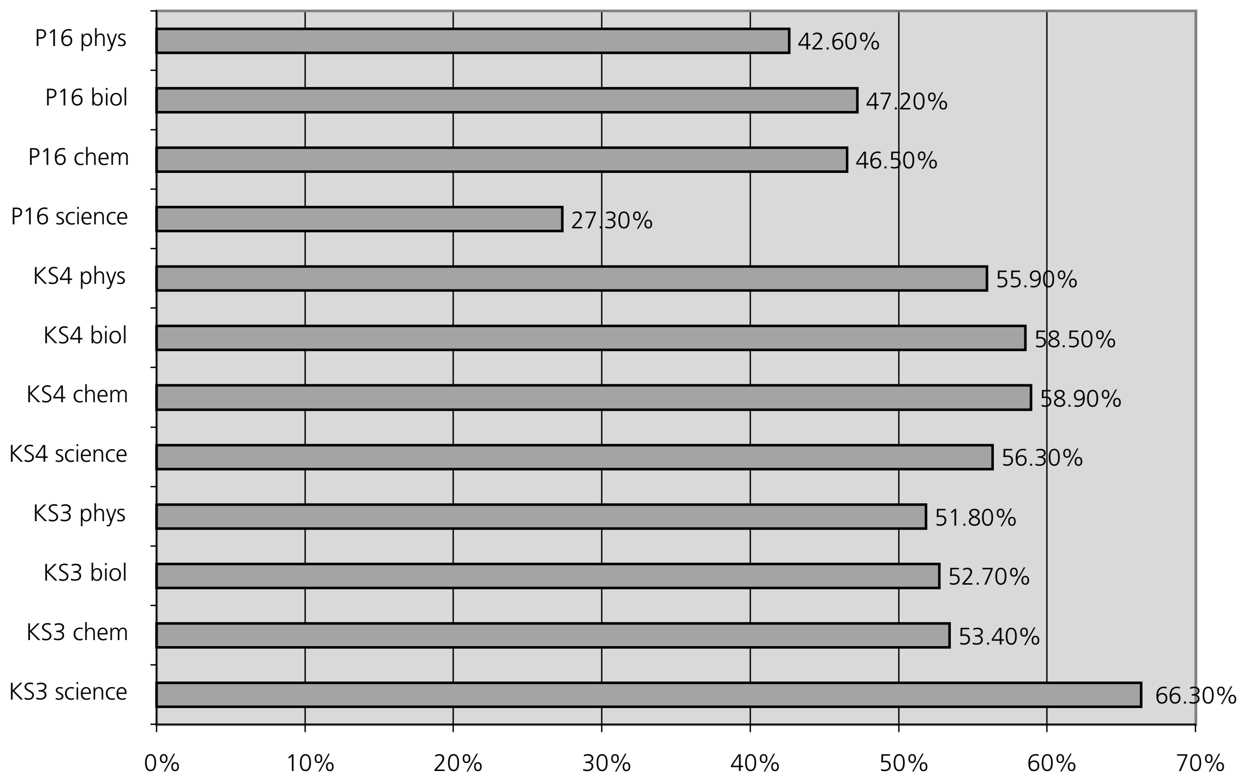
Technicians support a range of age groups, Key Stages, qualifications and science subjects (see chart 1). The extent of this range may contribute to the demands of a technician's role; it seems likely that the greater the breadth the more demanding the job.

Looking at the percentage of technicians who work in one or more of the twelve subject areas specified in the questionnaire (defined by pupil age and subject discipline[5]), there are three major 'peaks' (see chart 2 overleaf). Of those surveyed, 43% worked across 2-4 areas, 17% across 8 areas and 10% across 12 areas. The situation varies greatly between schools with one technician responsible for all the science provision to institutions where there are specialist technicians, for example in biology, chemistry and physics. The responses do not indicate the relative amounts of time a technician spends on each area.

Science specialism and rigour increases with age of student, and this puts particular demands on technicians who support all areas of science. The ASE Technicians' Committee believes that there were more 'single science' technicians 10 years ago.

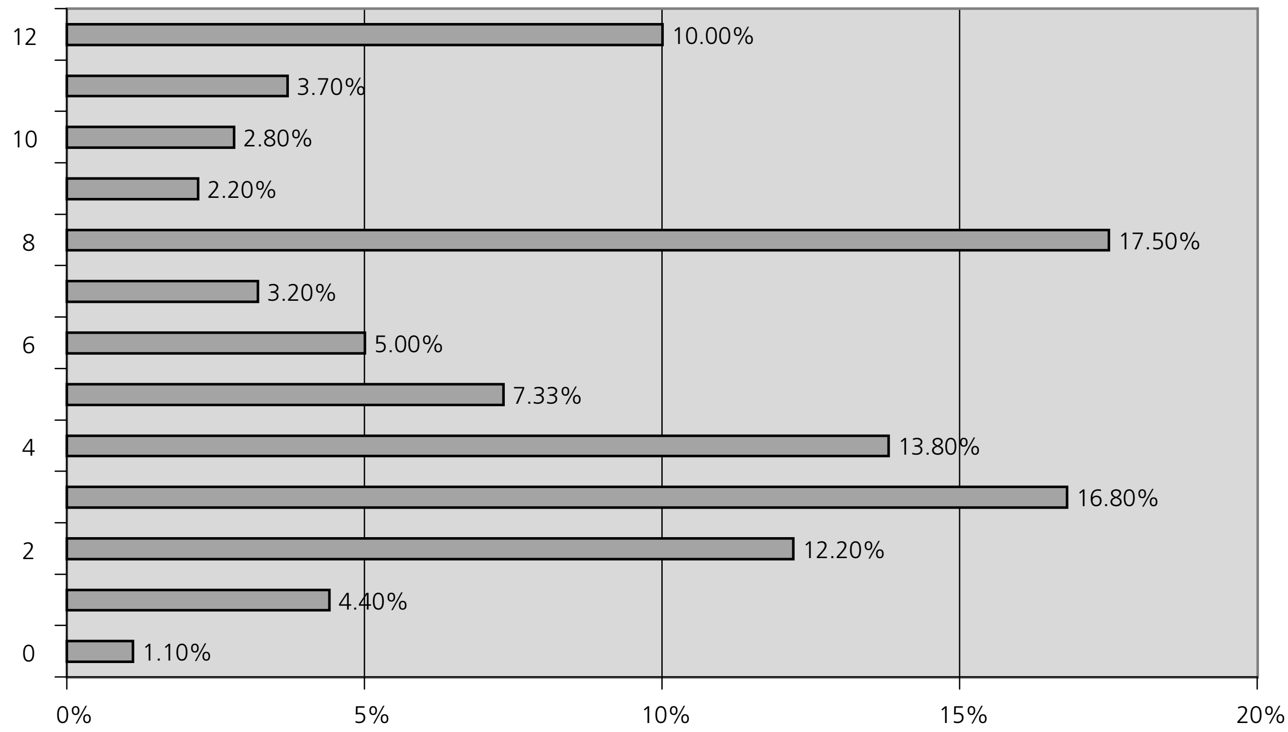
Working with students studying advanced level qualifications is very demanding. Technicians who work with these students must have a range of high level skills such as using electronics, preparing standard solutions and preparing and maintaining micro-biological cultures.

Chart 1: Main subject areas serviced



[5] The twelve subject areas were defined in the survey as: Science, Biology, Chemistry and Physics, each at Key Stage 3, Key Stage 4 and Post-16.

Chart 2: Number of subject areas covered by technicians (818 technicians sampled)



3.3 Roles and responsibilities

The roles and responsibilities of technicians vary greatly. Technicians carry out a wide range of tasks and, for the technicians surveyed, these are listed in Appendix 2. The percentages of technicians engaged in each task are also given. Comparisons with the 1994 ASE survey are not straightforward, since the numbers surveyed in 1994 were much smaller and the questions asked were rather different.

Much is said about the evolving role of laboratory technicians. Their work contributes to the quality of the teaching, learning and students' achievements in schools and colleges. In addition to skills demanded by new technologies such as IT and data-logging, time to support directly the work of students (as well as the continuing support of the teachers) appears to be growing. For example:

1994	
Active part in demonstrations	37%
Support in practicals	58%
Support pupils in class	37%

2000	
Taking an active part in demonstrations	69%
Assisting in practical classes	82%
Providing technical assistance to students	83%

36.4% of technicians surveyed worked on activities outside of the science department and this may impinge upon their time to support science lessons. 31.7% of technicians also took part in extra-curricular activities. It is unlikely that such work is a requirement of the post, but it may also affect their role as technicians. However, many technicians enjoy this involvement and by helping in these activities feel even more a part of the science team.

3.4 National criteria and job descriptions

Technicians want meaningful job descriptions allied to a clear career structure. Many suggest there should be a nationally agreed 'core' job description for technicians, but one that recognises local differences in the science curriculum being taught and how the science department is managed.

> *"As well as working towards nationally recognised qualifications for science technicians, I feel we should be working towards nationally recognised job descriptions and pay scales. Too many schools have very different views of what technicians should be doing and nationally recognised job descriptions would make it clear to schools what technicians should and should not be doing as part of their job role and help to remove the perception of science technicians as* de facto *'odd job' staff."*

There is a debate to be had about the professional nature of the job. The terms 'job', 'occupation', 'career' and 'profession' are often used interchangeably.

> *"The professional status of technicians, generally I feel, is still not recognised."*

3.5 Career progression

A clear career structure may only be possible if nationally recognised criteria for technician levels (such as 'trainee technician', 'technician', 'senior technician') are agreed. There would be value in investigating the use of terms such as 'laboratory manager', something that is becoming more common in further education colleges. Job progression might be from trainee technician to technician, with a choice of routes after that, leading to senior technician, laboratory manager or learning assistant. Of course, there are many options and these need to be explored.

Occupational standards were produced for laboratory technicians working in education and led to the development of S/NVQs (see Section 5: Recruitment and career progression). It may be appropriate to align any criteria for technician levels with these standards. The S/NVQs are under review (a QCA requirement of all NVQs three years after their accreditation) and so the time is opportune to consider this issue.

> *"I object to the title 'senior technician' as this implies a high salary scale and although I, in fact, carry out this role, whatever it is, it is never recognised by senior management."*

4 Pay grades and scales

4.1 Salary range

Perhaps not surprisingly, issues about pay produced the greatest number of written comments from technicians. Technicians surveyed were spread fairly evenly across a range of salaries (see chart 3). 28.9% earned £12,000 or more per annum, while 21.2% earned less than £8000. 43.0% of technicians surveyed were the main wage-earner and 24.3% were the only wage earner, comparable with the 1994 figures of 32.9% and 26.2% respectively.

4.2 Some comments from technicians

The following is a representative selection of what technicians said in their responses:

About the general feeling of frustration:

> *"Comparison with office staff who are on higher grades. Considering the amount of knowledge we must have and the fact that the equipment and solutions come into direct contact with the pupils, I consider this to be quite a responsible position."*

> *"The main feeling of frustration with the job is the poor pay. No chance of a pay increase or promotion, even though we have to be multi-skilled."*

About wage reviews and the recognition of the professional status of laboratory technicians in schools and colleges:

> *"I feel technicians are generally undervalued and, subsequently, underpaid. A wage review and salary reflecting the qualifications, ability and flexibility of technicians is way overdue. Technicians are not regarded as professionals and their duties are not understood beyond the science department. Therefore their salary does not reflect the importance of their position within the department or faculty. Sure, staff who work closely with them appreciate them but this is not reflected throughout the school, college etc. A more realistic starting salary for a full-time science technician would be £14000 with a degree, with a structure which would enable a technician to build on this with experience. Educating teaching staff about our job is required."*

About comparisons between their pay scales and those of other related professions:

> *"Our pay scales are too restrictive. I have no chance of any increase apart from inflation. If teachers can apply to go through the thresholds why not the technicians? If the Government wants technicians involved more in the classroom they must pay accordingly and value our contribution."*

> *"It would be very helpful if an official pay scale was given to all schools to cover science technician posts and this remained the same within counties. Science technicians of all kinds and qualifications have a strict pay scale in the NHS. Why are we different?"*

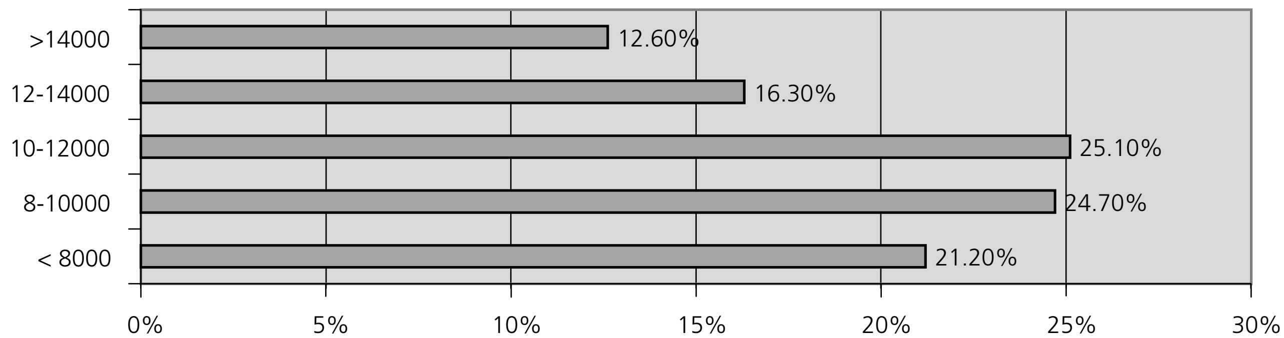
About concerns that some people managing schools and colleges are not fully aware of the role of technicians and, therefore, that this role is not recognised fully:

> *"Although science staff are generally appreciative of the value of the technician, the agency responsible for conditions of employment and salary scales i.e. head teachers and governors, are not aware of the range of responsibilities and value of technicians."*

4.3 Review of salaries and grades

It seems appropriate that job descriptions for different levels of technician (see Section 3: Job descriptions) should be linked to appropriate remuneration. If the work of technicians is to be valued, and its increasing complexity

Chart 3: Pay bands



recognised, a review of salary grades and scales would be helpful. Such action is needed, perhaps, if young people and new recruits are to be attracted to the job. Data from the survey indicates that currently they are not.

Initial observations are that pay scales for technicians in schools and colleges are not significantly out of step with technicians in industry or public service. There may be differences between LEAs and between the state and independent sectors. Incorporated colleges may also have different scales. Scales and positions on these are at the discretion of individual institutions.

Any unattractiveness of school laboratory technician as a career may be related to the use of term-time only contracts. These contracts reduce costs for schools and colleges, with the actual pay a technician receives being less than the full-time rate. An advantage for the technician is that s/he enjoys full school/college holidays, but for a person intent upon a career, the relative lack of full-time posts may be a problem. Term-time only contracts may be attractive to, for example, parents with young children returning to work. This supply of recruits means that schools and colleges are often able to employ high quality people on such contracts. However, there remains an issue of when the work that was traditionally carried out during school / college holidays is done.

5 Recruitment and career progression

5.1 Technicians today

The stereotype of technicians being middle-aged women has some substance when the gender and ages of technicians is looked at. The ratio of female to male technicians surveyed is 3:1, as it was in 1994. The age profile of technicians is skewed towards the older group, with almost 72% over the age of 40 (an increase of 4% from 1994), and the percentage under the age of 30 being 8% (a decrease of 2% from 1994).

Chart 4: Gender

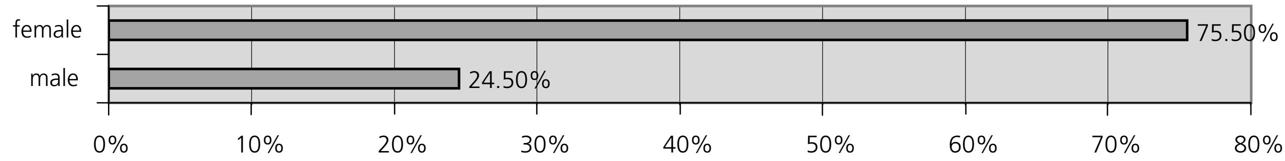


Chart 5: Technician Age Profile

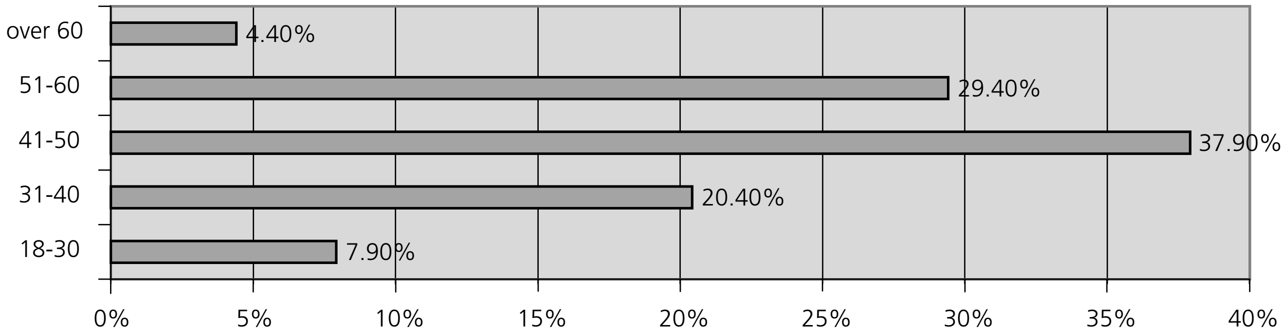


Chart 6: Age Range: Female (sample of 1715 technicians)

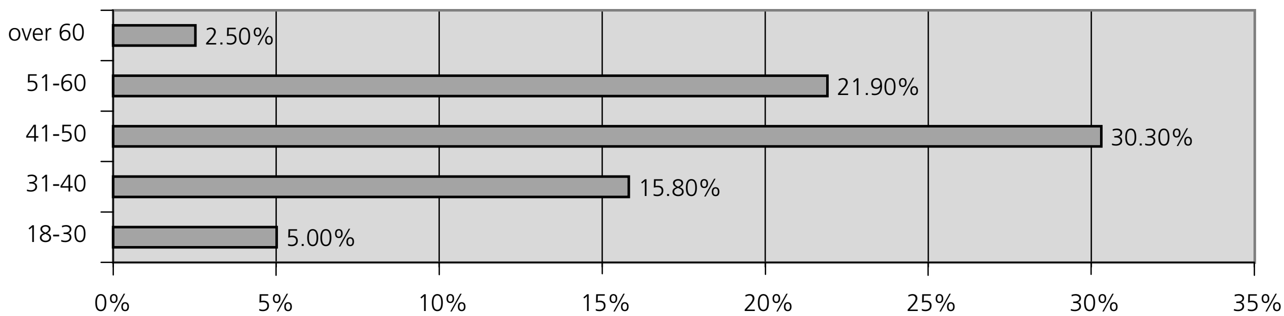
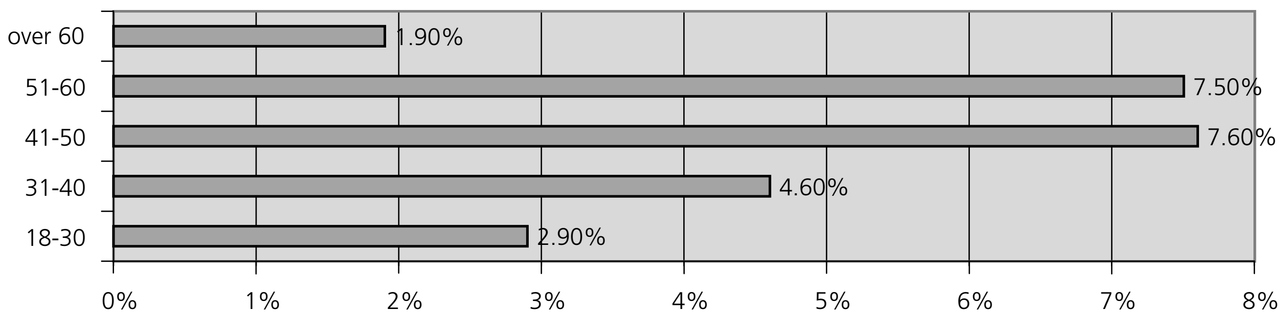


Chart 7: Age Range: Male (sample of 1715 technicians)



The average length of service of the technicians surveyed was 12 years and 7 months (compared with 13 years in 1994). The average length of time in their current post was 9 years and 9 months. This suggests there is little or no movement between posts for most technicians. Many teachers, in contrast, hold posts in two or more institutions during their career.

5.2 Attracting young people

There is little evidence that young people are being recruited into schools and colleges as technicians. If we wish to attract more young people to the profession then a well-defined career structure would surely help. Of course, any career structure must provide a path for established, as well as new, technicians. This is important in terms of technicians' personal development and their effective deployment within a science department.

5.3 Job satisfaction

Many technicians enjoy their work and find it satisfying, often mentioning the fact that they help students to be successful and realise their potential. However, many technicians are disillusioned because of their inability to progress as they gain experience and qualifications. A coherent career structure is lacking. The current situation appears to be that a school or college identifies its technician needs and produces a relevant, local job description. If there are several technicians in a department one may be designated senior technician. Criteria for this role are not clear (though it presumably includes managing others).

5.4 Promotion

38.3% of technicians surveyed have been promoted during the course of their career. However, many say that they have been in the job for many years at the same grade, with no opportunity to apply for a promotion even though the role has developed and requires higher level skills as new technologies (IT in particular) are introduced. The technicians surveyed also commented that they now undertake more work with students and that their administrative responsibilities have increased.

> *"My third post (which I am in now) has always been a scale 2 but I have not been offered anything higher even though we are a beacon school and we work to a very high standard to provide educational excellence in science and support."*

> *"A balance must be achieved between workload, pay and promotion. Fair, honest job evaluation should be carried out before, and after any technician appointments, by knowledgeable assessors."*

27.1% of respondents are senior technicians and 35.5% are technicians (the remainder did not answer the question, perhaps because they were the only technician in the institution). However, many technicians considered they were doing a senior technician's job, but that school / college senior management failed to recognise this. The difficulty remains: what defines the role of a senior technician? The issue of national criteria and job descriptions thus arises again (see Section 3: Job descriptions).

> *"There appears to be no real career structure to the job. Although appreciated by the science staff, no recognition is given for length of service or commitment to the school, by senior management. At this school all technicians are on the same pay scale point regardless of length of service or relevant qualification. Having said that the working conditions for technicians in this school are excellent – treated as part of the team by science staff – pity senior management do not feel the same."*

The danger is that the technician's role is seen as being a "dead-end" job. Little progress appears to have been made towards establishing a satisfying and attractive career structure and, again, technicians draw comparisons with other occupations.

> *"At present there are no provisions for promotion within the service (Civil Service Board). I would like to see at least the introduction of a seniority award pay scale or long service award. Most schools on the island* [Guernsey] *only have one technician with only the chance of annual cost of living pay rises – not much of a loyalty incentive."*

> *"Having joined the education system after a career in industrial engineering, I am very concerned at the lack of training/development of technicians and consequently their advancement under a non-existent career structure. People in the education system appear self-centred and give little time or thought to the well-being or aspirations of technicians. Neither the LEA nor the school management appear to want to take responsibility for the management/ development of non teaching staff."*

5.5 Being valued

There is a general perception among technicians that senior management does not understand the job of a technician and consequently do not value it.

> *"My concern is with the future of technicianship. I became a technician thinking that I had a career. I suppose I have done reasonably well but with cutbacks and legal requirements the job gets more impossible day by day. My junior will not stay much longer as he can see no future in the job (unless I retire!). How can we raise our*

status in the education system with appropriate financial rewards or are technicians doomed to extinction?"

"Since leaving college I have worked mainly as an analytical chemist in Q.C. labs. When I became a school lab technician I was surprised by the wide range of tasks which we are expected to perform. I have been given no specific training and yet the teachers seem to expect us to know it all and to solve all their problems when they themselves have no idea what practicals they are doing and how to do them. I feel that the profile of the technician must be raised."

6 Qualifications and training

6.1 Introduction

Over 90% of technicians surveyed have formal qualifications, ranging from GCSE to degrees (see chart 8). The vast majority had advanced level or higher qualifications.

6.2 S/NVQs

A national qualification structure for technicians working in education is now in place: S/NVQ (levels 2 and 3) *Laboratory Technician Working in Education*. The next step could be the recognition of a national career structure for technicians that relates to these occupational standards.

60.9% of technicians surveyed are aware of the new S/NVQ qualification for science technicians in education. However, only 10.5% are working towards it, (8.5% towards level 2 and 2.0% towards level 3). Two reasons were cited in the survey responses for this low take-up. There is still only a small number of centres which offer the qualification, although this is increasing. Secondly, and perhaps more worryingly, is the difficulty of obtaining funding for training. This may relate to the point made earlier – that school senior management is often not fully aware of the technician role and the need for adequate and relevant training. The effect is that some technicians do not see the S/NVQ as worthwhile because the school or college will not recognise it for promotion purposes.

> *"The new S/NVQ qualifications are not worth working for as schools will take no notice of them and will not offer any more money for the job. A great shame!"*

> *"I think that the new S/NVQ qualification is an excellent innovation and I feel that all school science technicians should be required to work towards it, especially those new to the job."*

> *"I am aware of the new S/NVQ laboratory technician working in education but have tried to get funding through the school with no success. This is a common problem within education – lack of funds for non – teaching staff training."*

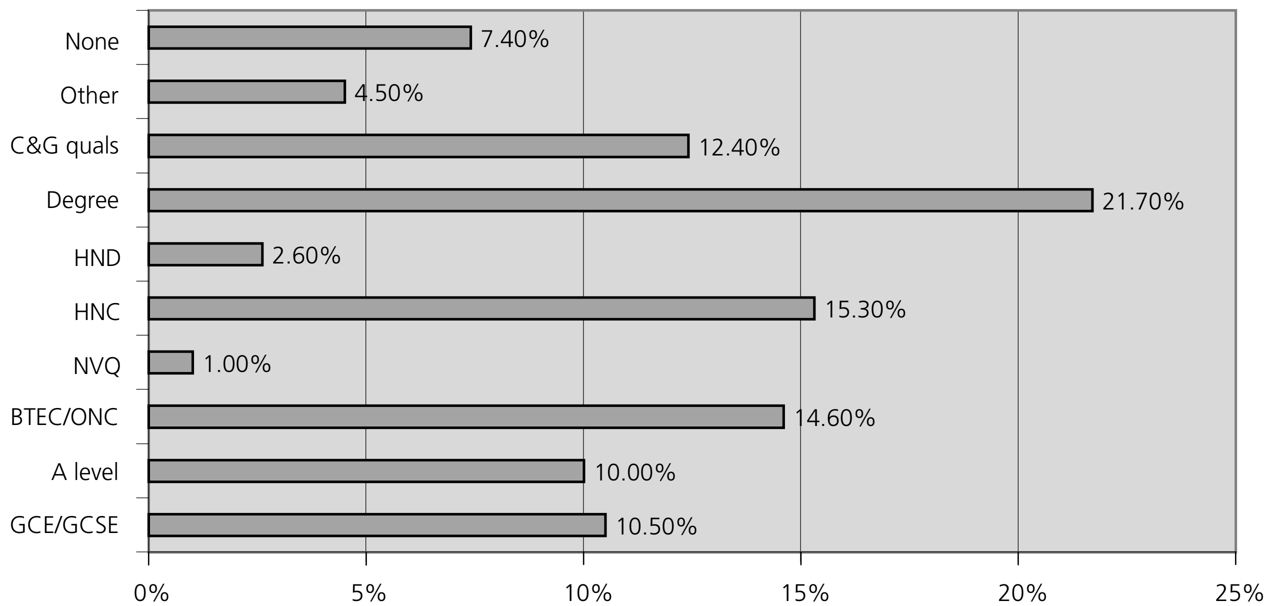
The S/NVQ (levels 2 and 3) *Laboratory Technician Working in Education*, is a qualification that attests to a person's competence to do the job. An Advanced Modern Apprenticeship (AMA) for laboratory technicians working in education is being developed. This training programme is for employed people and is based on the acquisition of the S/NVQ, key skills and other abilities and qualities necessary to become a school or college laboratory technician. It is intended for young people in the age range 16-25.

6.3 Training courses

Many technicians comment on their desire to be trained and to increase their skills, yet they are frustrated by a lack of opportunity.

> *"Having been a science technician in education for 14 years I found that I gained all of my training through experience. It would have been, and still would be,*

Chart 8: Technician qualifications (sample of 420 technicians)



helpful to have more structured training available for technicians. Better still, to incorporate training from college with 'trainee technician' status in schools or colleges would be more supportive for new technicians and maybe helpful to people like myself who are a one person department."

Most technicians are aware of the need to attend training courses in order to acquire new skills for the job or to update existing skills. 65% of technicians surveyed have attended (various) courses, other than those relating to health and safety, since starting in the job (see chart 9).

42.6% of technicians surveyed believe they have responsibility for health and safety and 24.3% have first aid responsibilities (although formal 'responsibility' rests with the employer). 30.7% attend health and safety meetings. Given that technicians make a major contribution to health and safety in science department this is, perhaps, a rather low figure. However, 62.4% have attended health and safety training courses, though it is of concern that for a third of these this was more than 3 years ago (see chart 10). Health and safety training should be provided, if required, as soon as technicians are appointed to their posts.

Chart 9: Training courses attended

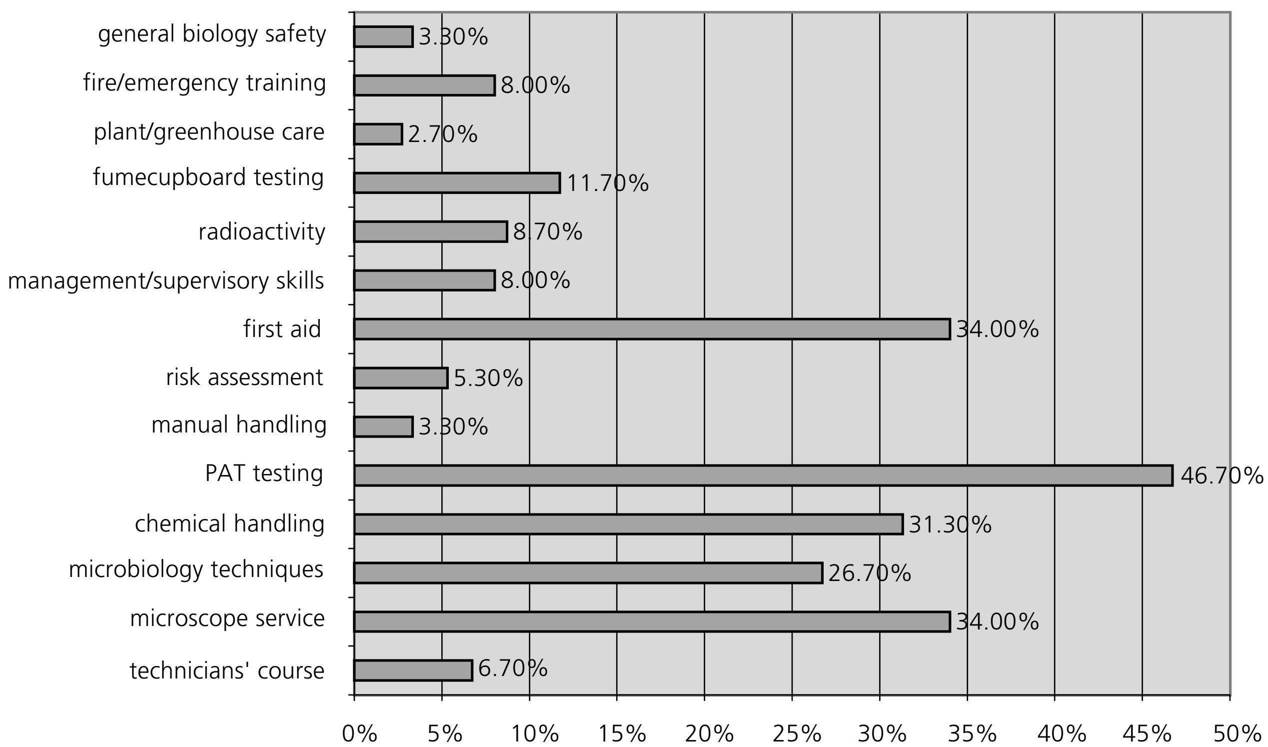
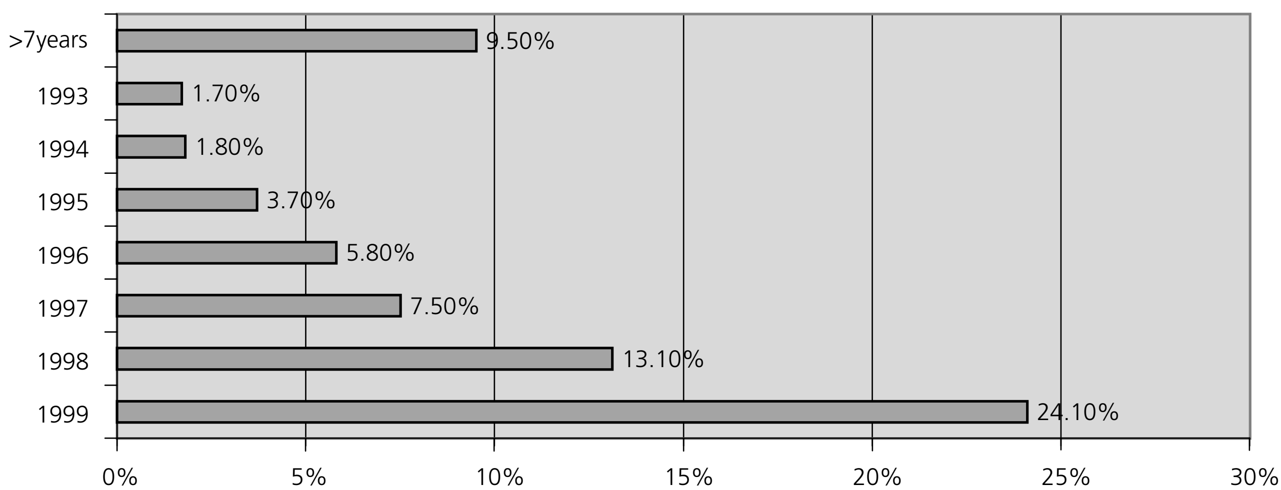


Chart 10: Age of Health & Safety Training (in 2000)



The Health and Safety at Work Act 1994 states that training is the prime duty of the employer. It may be delegated to, for example, the head of science, but the duty remains with the employer who must monitor the training.

"I don't feel I have had adequate training for the work I do – particularly in the health and safety aspect. The lack of appraisal opportunity means that there is no forum for structuring ones training or progress."

Information and Communication Technology (ICT) is a growing technology in laboratories and preparation rooms.[6] The survey indicates that the average number of computers in the science department is 8, with 28.7% of technicians surveyed having some responsibility for ICT in science lessons. 51.7% of technicians have access to a computer in the preparation room. However, only 29.0% of technicians have received ICT training.

Various people have provided the training: technicians (32.2%), teachers (35.7%) and outside agencies (42.0%). Of the technicians providing training it is not known whether these are science technicians or IT technicians.

6.4 The quality of training

Technicians' comments reveal some disturbing concerns about training and training courses. Training is often considered to be unplanned, not relating to the technician's professional development and appraisal schemes.

"I have had very little training in ICT even though it is a technology college. The training in science has been very ad hoc *and not formal."*

"Courses needed for more experienced technicians."

"After being promised training at my interview, it's taken over 2 years of continual reminders to my head of section before actually being given permission to attend one. It seems that some LEAs do not consider technician training particularly important and it shows an ignorance and lack of respect that others in education have for school science technicians and the job they do within the science department / faculty."

Practical work continues to be undertaken in schools and colleges while the technician is on a training course. This makes finding time to attend courses difficult because of the pressure of arranging for the workload to be covered during the technician's absence. There is no supply cover for technicians.

"Opportunities to go on courses are readily available and encouraged. However, the workload makes it virtually impossible to attend most of them."

"Attending courses is very difficult – the practicals are not reduced so everything has to be done before we go and too much to do on our return."

There was some call for training to be made available locally.

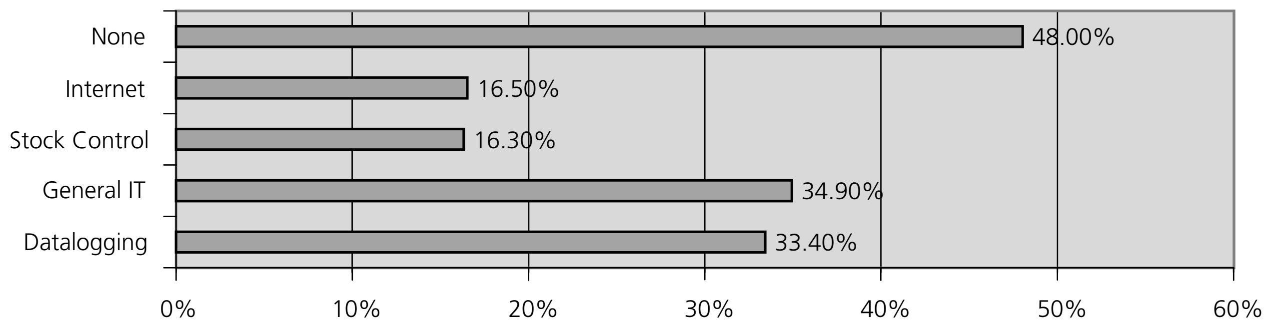
"I would like to attend courses but have found that they are not available locally."

"I am currently trying to get ICT training for stock control – part of my current appraisal target. This must be local and in work time. Not after hours or holidays."

There may be reluctance on the part of senior management to fund technicians' training. Technicians suggested that many senior managers do not see it as an essential or cost effective exercise.

"Courses for technicians have become fewer and fewer and increasingly expensive. Refresher courses would be useful but would not be value for money at current prices. A lot of valuable courses have disappeared. There is a 'catch 22' situation. Because of the cost of courses, schools do not send technicians on them and

Chart 11: IT training courses attended



[6] In a 2000 DFEE Statistical Bulletin: *Survey of Information and Communications technology in schools*, (DFEE, October 2000) it was reported that the average number of computers (desktops, laptops and palmtops) in secondary schools available mainly for curriculum purposes was 112.6. 98% of secondary schools were connected to the Internet. In science departments in secondary schools the use of IT was 'substantial' in 49%, 'little' in 49% and 'none' in 2%.

this increases the cost of courses or causes them to be deleted through lack of support."

"When information on courses is distributed, why is it always received by the Heads of Science and not technicians? When speaking to other technicians in our group it appears that certain information does not reach them at all on matters which concern them."

There is a clear demand by technicians for training courses. Relevant, accessible courses are essential if technicians are to update and develop their skills and contribute as effectively as possible to the science curriculum. However, this is only possible if courses and funding are available.

7 Value to the department and the institution

7.1 Introduction

Technicians can make a significant contribution to the success of the department. However, many feel that this fact is not recognised. There is also a feeling that technicians are not valued within their school or college.

> *"Is the contribution as a technician to the success of the science department acknowledged and appreciated both inside the department and outside? Probably not."*

> *"Technicians feel undervalued. All are well qualified and committed but feel that the senior management team only appreciate admin. staff."*

7.2 Departmental meetings

18.9% of technicians surveyed attend departmental meetings either always or frequently and 33.9% attend occasionally (see chart 12). However, 47.2% of technicians surveyed never attend departmental meetings. It is not clear whether non-attendance is because the technicians are not invited or because they choose not to go.

Some schools and colleges have taken steps to make sure that the views of technicians are heard and that they are a part of the decision making process. However, many have not yet done so. Technicians can contribute to more than discussions about laboratory use (timetabling, time needed for preparation and clearing away) and laboratory refurbishment. They can inform decisions about the practicalities of teaching and learning in the classroom or laboratory (for example whether it is possible to carry out a particular experiment or whether there is a better way). Technicians may become part of the direct support provided for students.

> *"It would be interesting to know whether any technicians are consulted and if so, at what level, when new labs or refurbishments are taking place in schools. Often there is no input allowed from the most important 'end user'. School authorities do not on the whole, value the immense practical knowledge acquired by technicians. What a waste!"*

> *"My present school has allowed me to show my worth and has encouraged it. I will be a tutor next year to which I am paid at a different level. I am left with a feeling of satisfaction and of being an important part of a strong team."*

> *"20+ years as a technician within the chemical research department of the pharmaceutical industry. I have particularly noticed, since joining a school, how little respect is given to any support staff; we appear to be 'invisible' if not a teacher. Although I am well qualified with many skills to offer these are not used. I have never experienced this attitude in all my time in industry where an experienced technician was highly valued."*

7.3 Appraisal

Intrinsic to any professional career is personal development, appraisal and continuing professional development. Relevant training, of value to the individual and to the institution, must be identified.

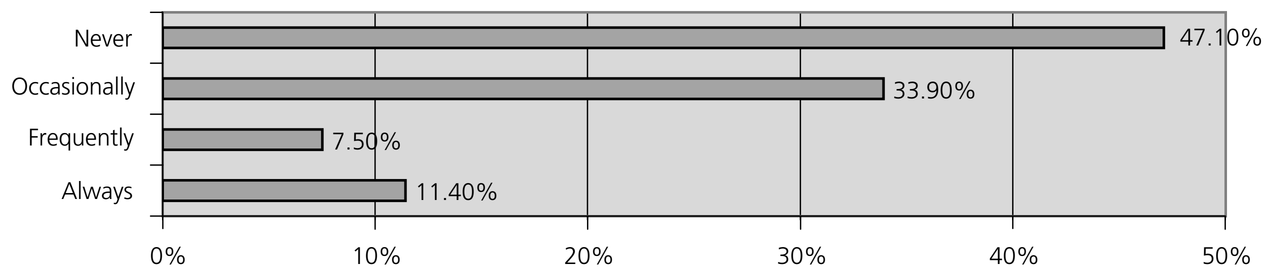
31.3% of technicians surveyed have been appraised. Of these, many are not happy with the process because although targets may be set they are rarely evaluated. This links, of course, to the issue of training discussed earlier (Section 6: Qualifications and Training).

Technicians are part of the science team that delivers the curriculum and supports the students. It is essential that they consider themselves part of this team.

> *"I have to say that I have an excellent working relationship with all the staff in my science department. They are supportive, considerate and make me aware that they appreciate the job that I do."*

> *"In my experience heads of department / faculty seem to have widely varying skills at managing their technicians."*

Chart 12: Attendance at department meetings



Appendix 1: Membership of joint ASE / Royal Society working group

Chairman

Sir John Horlock FREng FRS	Fellow and formerly Vice-Chancellor, The Open University

Members

Mr David Billings	Chair, ASE Laboratory Technicians' Committee
Professor Mick Brown FRS	Cavendish Laboratory, University of Cambridge
Mrs Helen Butler	Hull High School, Anlaby
Dr Ken Gadd	Education Consultant, 4Science Ltd
Mr Nick Glass	Acting Headteacher, Ansford Community School, Somerset
Mr John Lawrence	Deputy Chief Executive, ASE
Mr Phil Ramsden	Deputy-Chairman, Royal Society Education Committee
Ms Joyce Stuffins	Walton Comprehensive School, Peterborough
Mr Nigel Thomas	Education Manager, The Royal Society
Mr Bob Worley	CLEAPSS School Science Service and ASE Technicians' Committee
Ms Janet Wrigley	Staindrop Comprehensive School, Darlington

Appendix 2: Survey results - a summary of data obtained from the questionnaires

Number of schools and colleges to whom questionnaire distributed	4859
Number of schools and colleges who responded	1917
Percentage of schools and colleges responding	39.5%
Number of responses from individual technicians	5026

Part A: About your school/college

Question 2: Country in which you work

Country	Number of replies	% of replies
England	1636	85.34
Scotland	118	6.16
Wales	88	4.59
Northern Ireland	61	3.18
Channel Islands	8	0.42
Isle of Man	6	0.31
Total	**1917**	**100.00**

Question 3: Type of school/college

Type	Number	% of total	Comments
Comprehensive schools	1447	75.5	135 were voluntary aided and 113 were foundation schools. One school was a middle school. There were 557 11-16 schools and 886 11-18 schools.
Grammar schools	96	5.0	16 were voluntary aided and 9 were foundation schools. All schools taught pupils to age 18.
Independent schools	235	12.3	There were 205 schools teaching pupils to 18, 26 schools teaching pupils to 16 (including a special school) and 4 tutorial colleges.
Sixth form colleges	41	2.1	
Further education	97	5.1	These included technical colleges and colleges of further education.
Other	1	0.1	This was an anonymous reply.
Total	**1917**	**100.1**	

Question 4: Age-range and number of pupils

Age range	% of replies
Schools up to 14	0.05
Schools up to 16	30.46
Schools up to 18	62.08
Post 16	7.41
Total	**100.00%**

Mean no. of pupils on roll	
All schools	900
Comprehensive (all)	973
in Scotland	877
not in Scotland	980
Grammar	867
Independent	482
VI form college	(1044)
FE	(1921)

Question 5: Number of science teaching staff

1878 responses included a figure for number of full-time science teaching staff;
1883 responses included a figure for number of part-time science teaching staff.

Full-time	% of responses	Part-time	% of responses
0	1.2	0	23.2
1	2.0	1	26.6
2	3.0	2	24.5
3	5.7	3	12.5
4	8.3	4	6.5
5	11.2	5	3.3
6	12.9	6	1.2
7	11.2	7	0.7
8	11.8	8	0.4
9	8.9	9	0.3
10	6.6	10	0.2
11	5.3	11	0.2
12	4.5	12	0.2
13	2.8	13	0.0
14	1.9	14	0.0
15	1.4	15	0.2
16	0.9	16	0.0
17	0.5	17	0.0
18	0.6	18	0.1
19	0.0	19	0.0
20	0.5	20	0.1

Question 6: Number of technicians

1878 responses included a figure for number of full-time technicians;
1883 responses included a figure for number of part-time technicians.

Full-time technicians	% of responses	Part-time technicians	% of responses
0	28.4	0	32.9
1	38.2	1	27.4
2	20.6	2	20.4
3	9.4	3	11.4
4	2.1	4	5.6
5	0.7	5	1.5
6	0.4	6	0.6
7	0.0	7	0.1
8	0.1	8	0.1
9	0.0	9	0.0
10	0.0	10	0.0
11	0.0	11	0.0
12	0.0	12	0.0
13	0.1	13	0.0

Questions 7 and 8: Number of laboratories and preparation rooms

1905 responses included a figure for number of laboratories;
1885 responses included a figure for number of preparation rooms.

Number of laboratories	Frequency of responses as a percentage
1	0.4
2	2.0
3	4.3
4	6.9
5	11.3
6	14.9
7	12.8
8	14.4
9	10.0
10	7.6
11	5.1
12	4.1
13	2.0
14	1.6
15	1.2
16	0.7
17	0.2
18	0.3
19	0.1
20	0.1
24	0.1
Total	**100.0**

Number of prep rooms	Frequency of responses as a percentage
1	26.9
2	25.8
3	25.7
4	12.6
5	5.1
6	2.1
7	1.1
8	0.2
9	0.2
10	0.2
11	0.1
Total	**100.0**

Question 9: Location of laboratories

(a) Number of sites?
Single site: 63.8%;
Multiple sites: 36.2%.

Number of sites	Number of establishments
1	1224
2	527
3	136
4	21
5	5
6	3
7	0
8	1
Total	**1917**

(bi) Laboratories on different floors?:
Yes: 56.3%; No: 43.7%

Number of floors	Number of establishments
1	838
2	860
3	183
4	24
5	5
6	5
7	2
Total	**1917**

(bii) Hoist/lift available?
Yes: 17.9%; No: 82.1%.

Question 10: Lessons

(a) Length of each science teaching period?
Mean = 54 minutes.
(b) Number of science periods per week?
Mean = 184.
(c) Number of science periods in laboratories per week?
Mean = 174.
(d) If ordinary classrooms are used for science, is any equipment required for these lessons?:

	% of responses
Never	14.1
Occasionally	69.1
Frequently	7.4
Always	5.4

(e) Maximum class size?
Mean = 25.5.

Question 11: ICT training

Is the school involved in any of the NOF (New Opportunities Fund) ICT training for teachers?
Yes: 28.6%; No: 71.4%.

If so, which consortium has the science department opted for?
From a sample of 300 responses:

No answer given	44.4%
School is involved but no consortium given	16.3%
Research Machines/Open University	7.3%
Science Consortium	6.7%
ASE	3.8%
SFE	3.4%
Learning Schools Programme (LSP)	3.4%
Technology College Trust (TCT)	3.4%
SWIFT	2.2%
RM Computers	1.7%
Cambridge Consortium	1.7%
In-house training	1.7%
University of West of England (UWE)	1.1%
In Context	1.1%
MEON	0.6%
ICAA	0.6%
Local EAZ	0.6%

Question 12: Is the school a member of CLEAPSS or SSERC?

Yes: 99%; No: 1%

Other data derived from Part A of the questionnaire

Service factors (using the ASE equation)

Analysis of the distribution of service factor between different types of schools

	Comprehensive	Grammar	Independent	6th Form Colleges	FE Colleges
Max	1.17	1.00	1.84	1.68	2.22
3rd Quartile	0.57	0.68	0.74	0.96	1.06
Median	0.47	0.58	0.59	0.62	0.70
1st Quartile	0.37	0.46	0.41	0.52	0.48
Min	0.09	0.19	0.17	0.20	0.14
Mean	0.48	0.59	0.62	0.74	0.82
Standard Deviation	0.16	0.21	0.28	0.32	0.46
Range	1.08	1.36	1.67	1.48	2.07
Count	1406.00	93.00	223.00	38.00	73.00
Confidence Level (95.0%)	0.01	0.04	0.04	0.10	0.11

Summary of service factors in comprehensive schools by type

	All comprehensives	LEA only	Foundation	Voluntary-aided
Max	1.17	1.17	1.02	1.09
3rd Quartile	0.57	0.56	0.60	0.59
Median	0.47	0.46	0.52	0.51
1st Quartile	0.37	0.36	0.44	0.40
Min	0.09	0.09	0.24	0.21
Mean	0.48	0.47	0.53	0.52
Standard Deviation	0.16	0.16	0.14	0.16
Range	1.08	1.08	0.79	0.87
Count	1406.00	1168.00	109.00	129.00
Confidence Level (95.0%)	0.01	0.01	0.03	0.03

Summary of service factors in comprehensive schools by location

	All comprehensives	England	Scotland	Wales	Northern Ireland
Max	1.17	1.17	0.99	0.90	0.78
3rd Quartile	0.57	0.58	0.50	0.46	0.45
Median	0.47	0.49	0.39	0.37	0.35
1st Quartile	0.37	0.39	0.30	0.31	0.29
Min	0.09	0.16	0.09	0.09	0.11
Mean	0.48	0.49	0.42	0.39	0.39
Standard Deviation	0.16	0.15	0.18	0.15	0.15
Range	1.08	1.01	0.90	0.81	0.68
Count	1406.00	1191.00	96.00	73.00	38.00
Confidence Level (95.0%)	0.01	0.01	0.04	0.03	0.05

Chart 13: Distribution of service factors in comprehensive schools

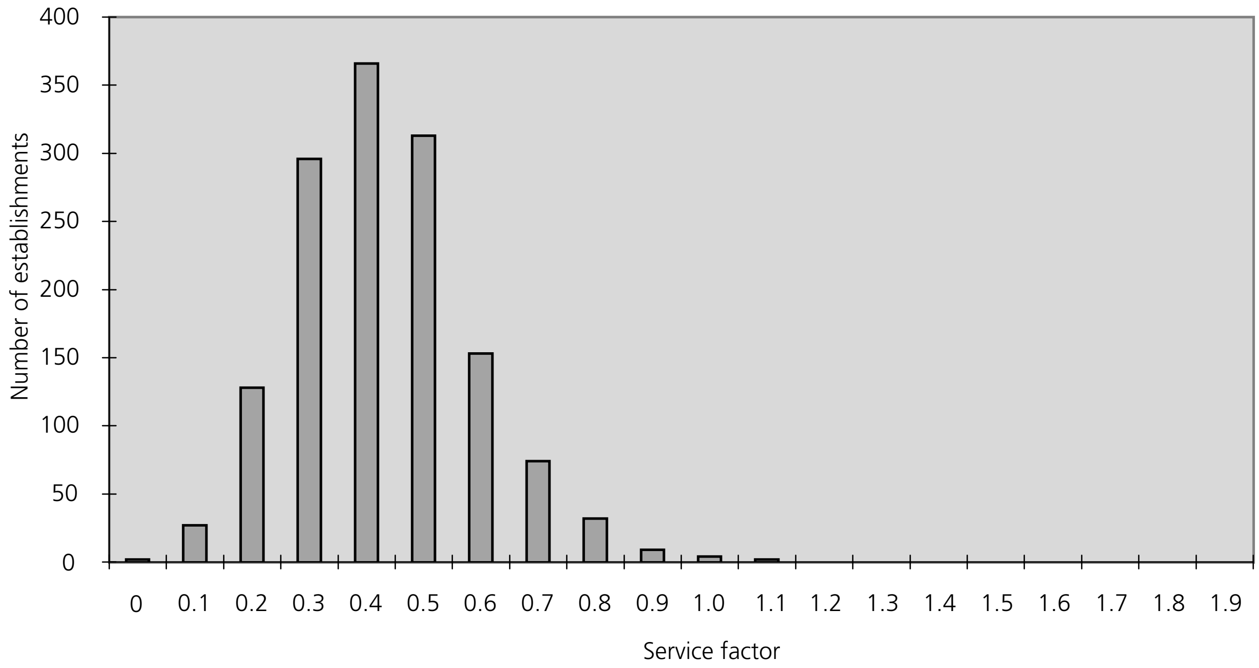


Chart 14: Distribution of service factors in grammar schools

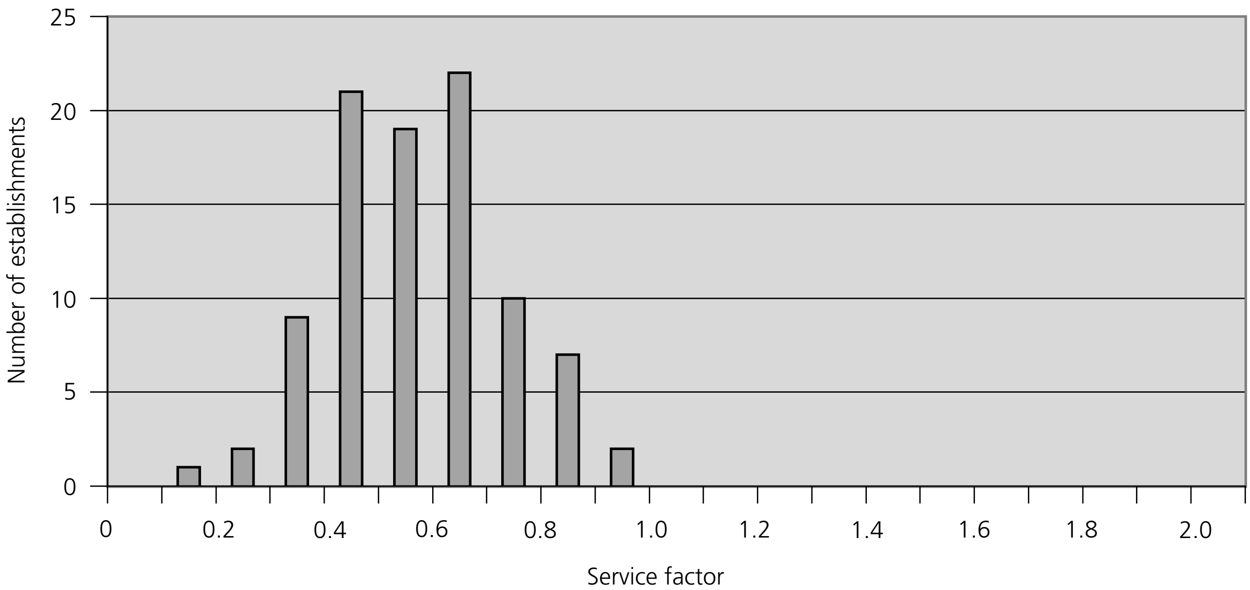


Chart 15: Distribution of service factors in independent schools

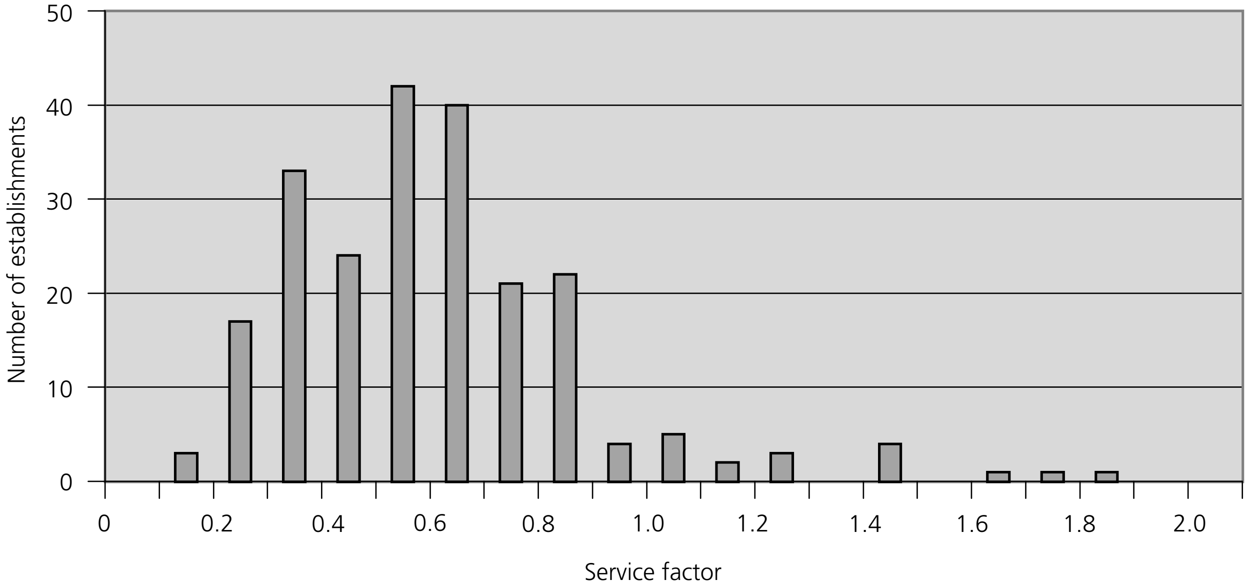


Chart 16: Distribution of service factors in sixth form colleges

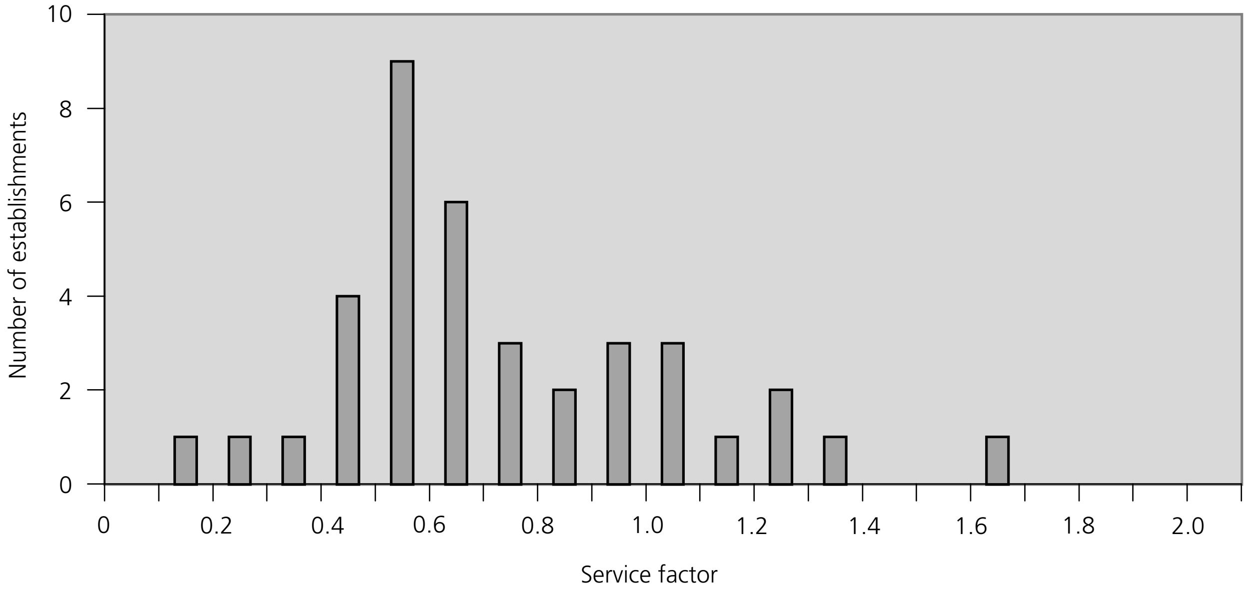
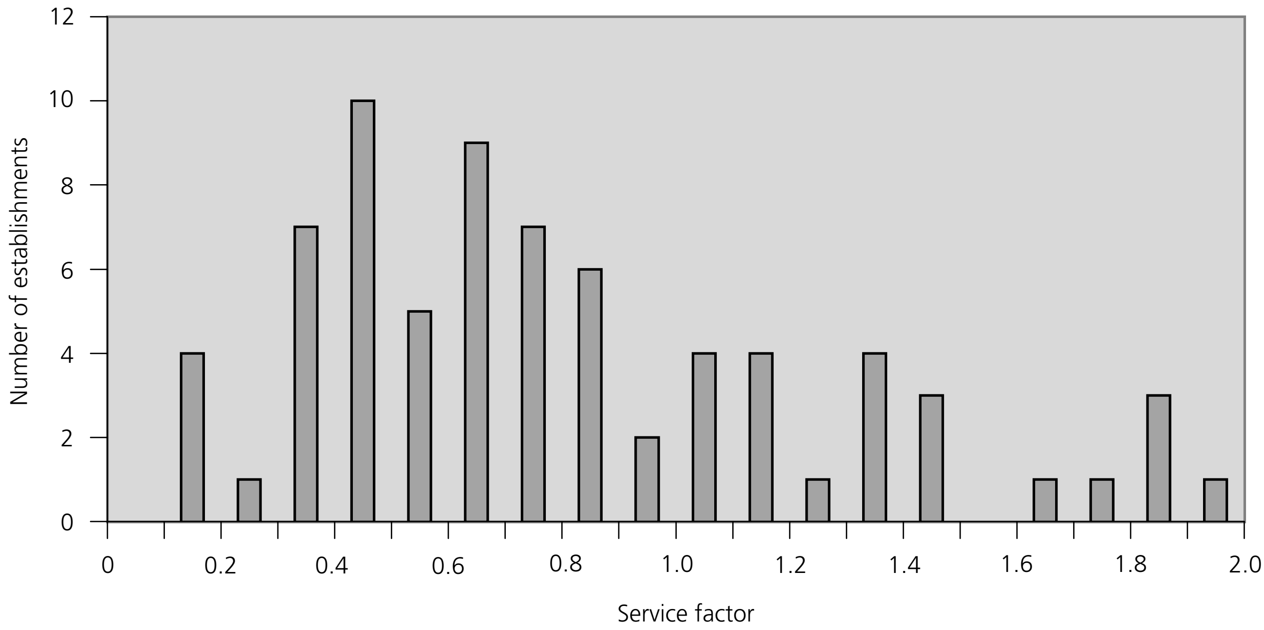


Chart 17: Distribution of service factors in colleges of further education



Part B About you, the science technician

Question 1: Personal details

Age range	% of respondents
18 – 30	7.9
31 – 40	20.4
41 - 50	37.9
51 - 60	29.4
Over 60	4.4

Using a sample of 1712 responses, the following relationship between gender and age emerged:

Age range	% Male	% Female
18-30	2.9	5.0
31-40	4.6	15.8
41-50	7.6	30.3
51-60	7.5	21.9
Over 60	1.9	2.5

Length of time as a school/college technician?
Mean = 12 years 7 months.

Length of time in present school/college?
Mean = 9 years 9 months.

Qualifications asked for when post was advertised	% of respondents
None	25.2
Degree	1.2
S/NVQ	5.0
A level	14.0
O level	37.8
GCSE	9.4
No response	32.6

Your qualifications	*% of sample of 420 respondents*
None	7.4
Degree	21.7
HND	2.6
HNC	15.3
NVQ	1.0
A level	10.0
BTEC ONC	14.6
GCSE / O level	10.5
Other	4.5
City and Guilds	12.4

Question 2: Duties

(a) Which main subject areas and ages do you cover?

Subject	KS3	KS4	Post-16
Science	66.3%	56.3%	27.3%
Chemistry	53.4%	58.9%	46.5%
Biology	52.7%	58.5%	47.2%
Physics	51.8%	55.9%	42.6%

A detailed analysis of 1715 responses showed the following workloads in terms of subject areas and levels of qualifications supported:

Subject areas supported		Level of qualifications supported: no. of responses		
		KS3 or equiv.	KS4 or equiv.	Post- 16
All three sciences		1100	971	516
Two sciences	Biology/chemistry	34	53	82
	Biology/physics	15	33	42
	Chemistry/physics	19	23	35
Single science	Biology	101	147	189
	Chemistry	105	140	189
	Physics	97	130	162
Total		1471	1497	1215
This area not covered		244	218	500

A detailed analysis of 818 responses showed the following workloads in terms of numbers of subject areas/age groups supported:

Number of subject areas/age groups	Percentage of sample of 818 responses
12	10.0
11	3.7
10	2.8
9	2.2
8	17.5
7	3.2
6	5.0
5	7.3
4	13.8
3	16.8
2	12.2
1	4.4
0	1.1

The twelve subject areas/age groups were defined as: Science, Biology, Chemistry and Physics, each at Key Stage 3, Key Stage 4 and Post-16.

(b) Number of science teachers supported?

Mean = 8

A detailed analysis of 1682 responses showed the following distribution of numbers of teachers supported:

Number of teachers helped	Frequency of responses	Number of teachers helped	Frequency of responses	Number of teachers helped	Frequency of responses
1	4	10	154	19	8
2	30	11	107	20	16
3	84	12	104	21	1
4	153	13	44	22	1
5	154	14	44	23	2
6	196	15	21	24	0
7	161	16	33	25	2
8	199	17	15		
9	141	18	8		

(c) Do you attend science department meetings?

Always: 11.4%

Frequently: 7.5%

Occasionally: 33.9%

Never: 47.1%

(d) Tasks carried out and their frequency

Task	% Often	%Rarely	%Never
Making up solutions	84.6	11.4	4.0
Assembly of apparatus	88.6	8.8	2.6
Constructing and modifying apparatus	65.5	30.6	3.9
Delivery of equipment to rooms	95.2	3.4	1.5
Collection, checking and return of equipment to stores	96.3	2.3	1.5
Disposal of waste materials	74.6	20.1	5.3
General laboratory cleaning	66.6	25.0	8.4
Cleaning laboratory sinks	58.1	30.2	11.8
Care of laboratory equipment and apparatus	94.4	3.2	2.5
Routine care of plants and/or animals	63.8	20.5	15.7
Organisation and storage of equipment	93.8	4.7	1.5
Maintaining resources	89.3	6.8	3.9
Carrying out/arranging for maintenance and repair of equipment	77.9	17.8	4.3
Stocktaking of chemicals and/or equipment	81.4	14.5	4.1
Obtaining materials by local purchases	77.5	17.8	4.7
Placing orders, checking deliveries and invoices	73.0	16.8	10.2
Keeping financial records	41.0	20.2	38.8
Trialing practical activities	51.5	35.6	13.0
Assisting in practical classes	27.0	55.0	18.0
Taking an active part in demonstrations	16.7	52.5	30.7
Assisting with field trips	14.6	38.0	47.4
Carrying out risk assessments for yourself	48.3	26.0	25.7
Checking fume cupboards	31.4	23.8	44.7
Safety checks on electrical apparatus	39.1	20.1	40.7
Checking first aid kits	33.2	26.9	39.9
Setting up IT equipment	35.9	35.8	28.3
Setting up AVA equipment	49.8	26.2	24.0
Off-air recording	22.0	18.2	59.8
Photocopying	65.2	20.1	14.6
Laminating, collating, binding	44.7	31.6	23.6
Checking textbooks back in after loan	52.5	25.3	22.2
Repair of textbooks	48.6	33.8	17.6

Task (continued)	% Often	%Rarely	%Never
Providing technical assistance to student teachers	52.6	25.6	21.8
Providing technical assistance to NQTs	50.0	19.8	30.2
Providing technical assistance to students	48.9	33.7	17.3
Providing technical assistance to teachers	62.3	27.0	10.7

Question 3: Health and safety

(a) Do you have any responsibility for health and safety in the department?
Yes: 42.6%; No: 57.4%.

(b) Do you take part in meetings on health and safety?
Yes: 30.7%; No: 69.3%.

(c) Have you ever been on health and safety training?
Yes: 62.4%; No: 37.6%.

(d) How long ago was your last health and safety training course?

	% of respondents
1999	24.1
1998	13.1
1997	7.5
1996	5.8
1995	3.7
1994	1.8
1993	1.7
Longer than 7 years ago	9.5

(e) Do you have any first aid responsibilities?
Yes: 24.3%; No: 75.7%.

Question 4: Personal development

(a) Have you ever been appraised?
Yes: 31.3%; No: 68.7%.

(b) Have you attended any training courses other than health and safety?
Yes: 65.0%; No: 35.0%.

Courses attended	% of respondents
General biology safety	3.3
Fire/emergency training	8.0
Plant/greenhouse care	2.7
Fume cupboard testing	11.7
Radioactivity	8.7
Management/supervisory skill	8.0
First aid	34.0
Risk assessment	5.3
Manual handing	3.3
PAT testing	46.7
Chemical handling	31.3
Microbiology techniques	26.7
Microscope servicing	34.0
Technicians' course	6.7

(c) During your career as a technician have you been promoted?
Yes: 38.3%; No: 61.7%.

Question 5: Are you aware of the new S/NVQ ?

Yes: 60.9%; No: 39.1%.
10.5% of respondents are working towards S/NVQ.
Of these, 80.6% are working towards Level 2 and 18.9% are working towards Level 3

Question 6: ICT

(a) Number of computers in science department?
Mean = 8 (mode = 3).

(b) Have you had any training in the use of computers in the school science department?
Yes: 29.0%; No: 71.0%.

(c) Are you responsible for supporting ICT use in science lessons?
Yes: 28.7%; No: 71.3%.

(d) What type of training have you received?

Datalogging	33.4%
General IT	34.9%
Stock control	16.3%
Internet	16.5%
None	48.0%

(e) Do feel your training in using computers has been adequate?
Yes: 29.3%; No: 72.3%.

(f) Do you have access to a computer in your prep room?
Yes: 51.7%; No: 48.3%.

(g) If you have had any training, who was it delivered by?

Another technician	32.2%
Teacher	35.7%
Outside agency	32.1%

(h) Do you belong to a local support group?
Yes: 14.3%; No: 85.7%.

Question 7: Conditions of service

(a) Are you a:

senior technician?	27.1%
other technician?	35.5%
No response	37.4%

Of the senior technicians: 50.5% are full-time; 49.5% are part-time
Of the other technicians: 41.2% are full-time; 48.8% are part-time

(b) Number of weeks per year employed
For full-time senior technicians, mean = 46.4.
For part-time senior technicians, mean = 40.0.
For full-time technicians, mean = 44.0.
For part-time technicians, mean = 40.0.

(c) Breaks during day
64.0% of respondents take a morning break. Mean length = 15 minutes.
67.0% of respondents take a lunch break. Mean length = 40 minutes.
23.0% of respondents take an afternoon break. Mean length = 15 minutes.
11.2% of full-time technicians take no break at all; this rises to 26.4% when part-time technicians are included.
17.4% of all technicians take all three breaks.

(d) Do you work overtime ?
1324 technicians answered this question.

Overtime	**Paid/Lieu**	**Paid**	**Time in Lieu**	**None**	**Total**
Regular	7	13	88	51	159
Occasional	42	134	453	117	746
Never	(1)	(11)	(35)	372	419
					1324

The numbers in brackets represent technicians who could claim benefits back if they did work overtime or who have filled the form in incorrectly.

(e) Do you have duties outside the science department?
Yes: 36.4%; No: 62.6%.
Examples:
Work in the D&T department
Mid-day supervision
Risk assessor
Whole school electrical testing
Whole school audio visual aid technician
Whole school first aid
School photographer and press co-ordinator
Whole school fire extinguisher checks
Gardening
Enrolment duties
Photocopying duties
Careers room co-ordinator
Staff news magazine work

(f) Do you get involved in any extra-curricular activities?
Yes: 31.7%; No: 68.3%.
Examples:
Music/ Productions
Sponsored activities and Fairs
Science Club
Activity week activities
Open days/evenings
Sport
Plays/Theatre trips
Young Enterprise Scheme
Visits
Presentation evenings
Field trips

(g) Do you demonstrate experiments and/or general science techniques to:

Teaching staff?	37.4%
Students?	38.1%
Other technicians?	32.3%

When the question was directed at Senior Technicians only, the results were:

Teaching staff?	56.5%
Students?	38.1%
Other technicians?	49.5%

If yes, what tasks do you demonstrate?
From a sample of 300 responses:

None	42.4%
General equipment – setting up and use	10.7%
Biology/Microbiology techniques	6.5%
Data logging	5.9%
General experiments – use	5.0%
New experiments	4.7%
Physics techniques	4.5%
Chemistry techniques	4.5%
ICT/Computer techniques and use	3.5%
New equipment	2.7%
Making solutions	2.7%
Titrations	1.8%
Glassware – bending, joining, building	1.8%
Good practical techniques	1.5%
Experiments with high risk	0.6%
Electrical circuits	0.6%
Health and safety	0.6%

Question 8: Salary

(a) In which pay band does your gross salary fall?

	% of respondents
Under £8000	21.2
£8000-10,000	24.7
£10,000-12,000	25.1
£12,000-14,000	16.3
Over £14,000	12.6

Salary	Number of full-time senior technicians	Number of part-time senior technicians
Under £8000	5	23
£8000 - 10000	38	31
£10000 - 12000	67	29
£12000 - 14000	71	21
Over £14000	68	8
Total	249	112

Salary	Number of full-time 'other technicians'	Number of part-time 'other technicians'
Under £8000	1	173
£8000 - 10000	53	72
£10000 - 12000	86	39
£12000 - 14000	47	9
Over £14000	32	11
Total	219	304

(b) Do you belong to a pension scheme?
Yes: 68.0%; No: 32.0%.

(c) Does you employer contribute to this pension scheme?
Yes: 77.9%; No: 22.1%.

(d) Are you the main wage earner in your household?
Yes: 43.0%; No: 57.0%.

(e) Are you the only wage earner in the house?
Yes: 24.3%; No:73.7%.

(f) Write down any professional bodies/unions to which you belong:

	% of sample of 300 responses
None	45.6
UNISON	24.0
ASE	12.6
Professional Bodies (various)	7.7
MSF	3.2
IST	2.3
GMB Union	2.3
NALGO	0.7
T & GW Union	0.7
AEUW	0.3
NIPSA	0.3
Connect	0.3

Appendix 3: Case studies

To illustrate how science technician support is used in a range of situations, visits were made to twelve schools / colleges during the 2000/01 academic year. Each case study describes the location and layout of the laboratories and preparation room(s) in the school or college, gives the number of technicians and a description of their deployment, and outlines the tasks performed by the technician(s) over a week. The studies also give an overview of how the technicians work with other members of the science department and a brief description of opportunities available for professional development.

The types of institutions visited are listed below, and the reports resulting from these visits are given on the following pages.

Case Study 1: Further education college on the outskirts of a city

Case Study 2: 11–18 independent girls boarding school in residential area

Case Study 3: 11–18 independent Roman Catholic co-educational school in a rural area

Case Study 4: 11–18 comprehensive school on the outskirts of a large city

Case Study 5: 13–18 comprehensive school set in a market town

Case Study 6: 11–18 school in a city centre

Case Study 7: Purpose built 13–18 comprehensive school

Case Study 8: Independent high school situated in a city suburb

Case Study 9: Tertiary college, located predominately on one site

Case Study 10: 11–18 comprehensive in a city

Case Study 11: City Technology College in a large town

Case Study 12: 11–16 comprehensive school in a market town

Case Study 1: Further education college on the outskirts of a city

This single-site college on the outskirts of the city centre has a pleasant outlook being in a green belt area. One side is bounded by a busy road, but opposite there is a park verging on to a river. The science department caters for about 4000 full-and part-time students. Courses provided range from GCSE through A level and vocational courses, to part of a degree course with a local university.

Science department

There are six laboratories: two biology, two chemistry (one has been part converted to provide a small computer facility), one physics and one optics. The laboratories are serviced by two preparation rooms (one for physics and one for chemistry / biology) and one store room.

All laboratories are on the same floor with entry *via* either side of one corridor. The physics preparation room is adjacent to the physics laboratory and the chemistry / biology preparation room adjacent to the chemistry/biology laboratories. This layout makes for the easy movement of apparatus and equipment between the laboratories. Part of the work for the physics technician is with the computer and electronics department on other floors, but a lift is available for the movement of equipment between floors.

The laboratories are fairly standard in layout although they do differ in the type of benches in each laboratory. One of the biology laboratories has peninsular benches. The second biology laboratory has perimeter benching with no fixtures in the centre but with moveable tables and chairs for tutorial work etc. The chemistry and physics laboratories both have island benches with the necessary services all on the islands.

Technicians

There are two full-time technicians, one for chemistry and biology and another for physics. Part of the workload of the physics technician is in dealing with computer maintenance and the servicing of electronic equipment across college.

- Monday: a full day with preparation for classes, chemicals and apparatus to be set out for practical classes. The technician has five practical sessions over the day and so the whole day is spent clearing away and setting out for new practicals.
- Tuesday: much as for Monday with a slightly lighter workload.
- Wednesday: a very busy day with a HNC group in all day. This creates a heavier workload with practical classes and project work on top of the usual practicals for full-time classes.
- Thursday: reasonably quiet with considerably fewer practicals. A chance to catch up with the paper work and to have a clear up and sort out in the preparation room.
- Friday: a hectic morning with three practicals to cover. The afternoon is quiet with a chance to finally clear up from the whole week and to start to think about the workload for the next week.

The technician is also expected to be available to support the practical lessons when they are on, with help if equipment and apparatus does not work etc. The two technicians can cover for each other if necessary.

Working practices

The technicians use A5 request sheets for practical / demonstration requests. Teachers request all their needs for the practical.

On Monday morning the technicians have the request forms for the week and can plan their work schedule. They still do get the odd emergency request for a practical session but in general this is kept to a minimum and hence can be coped with. The system works. Ordering and stock checking of equipment and chemicals is carried out at intervals during the term.

Working relationships

The technicians have excellent working relationships with the staff and feel involved in the running of the department. There is now a new working practice in force with a one hour slot set aside each week for section meetings throughout the college. The technicians are invited to and play a role in the section meetings. They have the opportunity to make suggestions to enhance the running of the section.

Suggestions are made to staff regarding the provision of practicals – for example offering suggestions for alternative practicals to ease pressure on resources etc.

Professional development

The technicians are able to attend INSET courses as and when appropriate. However, there is always a call for more courses to be arranged, and so the question of availability is the one that needs answering.

Case Study 2: 11-18 independent girls boarding school in a residential area

This single-site school is based in attractive grounds in a leafy residential area. During the past 10 years facilities have been expanded and new building works carried out.

Science department

The science department occupies a separate two-storey building. It caters for approximately 400 full-time pupils in any one year. Year 5 and Year 6 pupils (from the preparatory school) also use one of the laboratories within the building once a week. The science provision is GCSE to AS and A level. A science club is also run after school as part of the pupils' enrichment programme.

The science department has 7 laboratories: two biology, two chemistry, two physics and one small general laboratory used by the preparatory pupils. There are three preparation rooms (one for physics, one for chemistry and one for biology) and three store rooms. Within the science department, the sixth formers have their own study room. In addition, there is a room for the head of science and a separate science staff room.

The laboratories are split between two floors. The physics laboratories are on the carpeted ground floor, while chemistry, biology and the staff and student areas are on the top floor. There is only stair access to the first floor, making the transport of materials difficult if subject areas were rearranged. On both floors access to the laboratories is directly from the main corridor.

The physics preparation room is adjacent to the physics laboratory and the chemistry / biology preparation room adjacent to the chemistry / biology laboratories. This layout makes for the easy movement of apparatus and equipment between the laboratories.

The laboratories have a common layout. Fixed benching housing the majority of the services is found at the perimeter of the room, with tables arranged facing a board in the centre. In the majority of the laboratories, the flexibility of the central area has been greatly reduced by fixing electrical sockets to the tables.

Technicians

The science department has two full-time technicians (37 hours per week) and one part-time technician (24 hours per week). One technician covers chemistry, one biology and one covers physics. The weekly timetable covers all year groups and the requirement for practical work varies from one week to the next. Technicians are sometimes asked to provide support in the classroom during practical sessions and on occasions they are asked to carry out demonstrations. However, this largely depends on the individual teacher concerned.

Technicians cover for each other should the need arise. The biology and chemistry technicians felt quite comfortable covering for each other but the physics technician is less comfortable covering chemistry.

Working practices

The technicians use request sheets for practical / demonstration requests. The chemistry technician receives practical requests on a Thursday ready for the following Monday. For biology and physics the teachers request equipment 24 hours in advance of their practical class. Some teachers request all their needs for the practical and, depending on the teacher–technician relationship, others give a brief outline of their requirements. When the latter occurs, the technician and teacher have worked together on the same practical on numerous occasions.

The technicians still do get the odd emergency request for a practical session but in general this is kept to a minimum and hence can be coped with. The system works. Ordering and stock checking of equipment and chemicals is carried out at intervals during the term. Technicians order stock when necessary and all orders are signed by the head of science who has the responsibility of keeping within the allocated budget.

Working relationships

The technicians have a good working relationship with the staff and feel part of the science team. Technicians have recently been invited to science team meetings. Although listened to, the technicians thought that the main decisions had already been made and that they were simply being informed of what was likely to occur. Technicians were never asked to attend more general school meetings and therefore had no influence outside of the science department.

Professional development

The technicians had few requests for professional development, but did mention:

- training in the use of datalogging equipment and computer equipment;
- information about risk assessment.

However, above all, they would like to work towards a recognised qualification, such as the NVQ for laboratory technicians, that had status and influenced career progression.

Case Study 3: 11-18 independent RC co-educational school in a rural area

The schools is set in parkland with administrative offices housed in the old original building with new buildings arranged off it. It is situated a quarter of a mile from the main road. The school has approximately 1000 pupils on the roll.

Science department

The science department is in one building and looks out on to a courtyard with gardens on one side and playing fields on the other side. It offers GCSE and GCE A/AS levels. There are twelve laboratories, three each for biology, chemistry and physics and three for general science. The latter are used for Years 7 and 8 before they specialise. There are four preparation rooms, which are crowded but of a reasonable size, and a chemical store.

The laboratories are in one block but split between two floors. The general science and biology laboratories are on the ground floor. They are situated either side of a corridor, with two of the preparation rooms opposite one another, one between two of the general labs, and the other between two biology laboratories. The layout of the upper floor is similar with the chemistry and physics laboratories and two further preparation rooms. The layout of the laboratories varies with the older physics and chemistry labs having fixed benches with services to each bench. The others have been refurbished and consist of island benches with services and moveable tables butting up to the islands. One of the general science labs has an interactive white board.

Technicians

There are six technicians. Three are full-time (37 hours per week) with one of these being full-time the whole year and the other two term-time only. The other three technicians are term-time only, 4 days per week. Three technicians service the general science and biology labs on the ground floor and three service the chemistry and physics labs on the first floor. They are all multi-skilled and move between floors as the need arises.

- Monday: fewer practicals in the morning gives a chance to clear anything left over from the previous Friday. Experiment and equipment requirements are prepared in advance for the next day. Biology technicians have to check the animals first thing in the morning after the weekend. They also need to walk around the grounds to collect specimens for the week.
- Tuesday to Thursday: similar. Laboratories very full with practical sessions most periods. Time is filled with continually clearing away and preparing practicals. Interspersed with photocopying requests and paperwork.
- Friday: less busy with fewer practical sessions. A chance to catch breath and finally clear up and start planning for the following week.

The technicians have one computer in the prep rooms used for inventory and stock control. They also have access to a computer in the staff room. Ordering of stock goes through a central store for the whole school. It is delivered to a separate area, the problem then being to get it into the department.

Working practices

Each member of staff is given a book in which to write the orders for practicals. One page is used for each week. The page is tabulated with days of the week against periods (1 to 8). Each set experiment is given a code number and so the teacher just inserts the experiment number in the appropriate space. All books are kept in the prep room and teachers are supposed to enter information in them in the prep room for the whole week's practicals. However, some teachers do take them away and forget to return them.

The system gives a good indication of when equipment is in use; it works reasonably well. Emergency situations still arise, but are kept to a minimum and can be coped with.

Working relationships

The technicians have good working relationships with the staff. They get involved in practicals to support the use of equipment. Technicians are not invited to staff meetings. The head of science will talk to the technicians after staff meetings and inform them of any appropriate points. Technicians only comment on timetabling when it has been completed.

Professional development

There is no planned professional development for technicians. They are encouraged to go on training courses and money has been made available for attendance on courses and at conferences. The school has enough technicians to provide cover for when courses are available; the problem is availability of courses locally.

Case Study 4: 11-18 comprehensive school on the outskirts of a large city

The school is surrounded by housing and other schools with playing fields at the rear. The school has around 1100 pupils.

Science department

The department teaches GCSE Double Award Science and modular A levels in biology, chemistry and physics. It also runs a one-year single science GCSE for A level students. The department considers itself very under-funded.

There are eight laboratories, seven in one block and the other in a mobile classroom. All laboratories are general with all three sciences taught in each. However, chemistry is predominately timetabled in the three that have fume cupboards. Each laboratory is assigned to one teacher, who may be a specialist but will teach the three sciences and will stay in the one laboratory. This is convenient for the teachers. However, the technicians must 'change' laboratories from one science to another with the equipment.

The laboratories are on two floors in the main block, three downstairs and four upstairs. The layout is conventional with all laboratories leading off corridors. There are four preparation rooms: one on the ground floor, two on the upper floor and one in the mobile classroom. All of the stock chemicals are kept in the upper floor preparation room that is the senior technician's base. Ordering and stock control is carried out here. It is the only true preparation room, the others are used only for storage. The preparation room in the mobile classroom is self-contained and teachers can get equipment themselves.

There is no lift and so equipment has to be carried up and down stairs between the different laboratories. This must be done during lesson times when no students are around and it generally takes two people (to open doors and so on). Careful planning of movements is vital. Work is in hand to limit the problem either by spreading equipment between laboratories or by moving classes.

The laboratories are fairly standard in layout and look the same as each other (nothing characterises them as biology, chemistry or physics, except the existence of fume cupboards). All have island benches with services, with moveable tables arranged around the island. Storage cupboards are in the fixed benches around the walls. One laboratory is being refurbished this year but not the associated preparation room.

All lessons take place in the laboratories, so they are used for non-practical lessons and as form rooms. Even when there is no science lesson timetabled in a laboratory it is often taken over with a non-science lesson, making it very difficult to clear up and keep clean.

Technicians

There are two full-time, term-time only technicians (37.5 hours for 38 weeks). One technician looks after the laboratories upstairs and the other technician looks after the laboratories on the ground floor and the mobile classroom. One is graded Senior Technician due to the handling of budgets, ordering and other responsibilities.

- Monday to Wednesday: moving between lessons, setting up equipment and clearing away when possible. Making up solutions. Photocopying. Little opportunity to get in the laboratories to clear equipment and clean sinks etc. Hence technicians usually end up as working breaks and lunch times.
- Thursday: really the start of the week. Should start to receive the laboratory sheets for the next week. This is where the planning of equipment distribution starts – planning who needs what where, and hence what transfers of equipment are needed between the laboratories. The preparation of practicals for Thursday must also be done.
- Friday: similar work pattern to Thursday. These are the busiest days. It should now be possible to start to arrange for teachers to move rooms if necessary or to get teachers to change practical if equipment is being used elsewhere. The preparation of practicals for Friday must also be done.

Working practices

Teachers fill in request sheets – one sheet for each teacher for the whole week. Each sheet has a grid with days of the week against the periods (1 to 8). Teachers have to have these completed by Thursday. Technicians have identified a code system for the particular practical worksheets and it is these codes which teachers use. The system generally works satisfactorily.

The equipment is usually put out on trolleys in the prep room and then wheeled into the labs or equipment carried downstairs. Standard experiments cannot be kept intact in trays due to equipment continually being needed in other trays in other rooms.

A major problem is that there is not enough equipment, beakers, test tubes and so on to keep each laboratory stocked. Therefore equipment is frequently being moved up and down stairs and between laboratories. This does not leave much time for checking breakages, electrical testing, development work and so on.

Working relationships

The technicians generally have a good working relationship with most of the teachers, and much credit is due to a new head of department. Teachers are generally supportive, but there is still perceived to be a 'them and us' situation. Not all teachers understand the problems encountered by the technicians, concentrating on their lesson counts and not seeing the wider picture.

The technicians do not attend departmental meetings. However, they do get the minutes and a report afterwards. They are not involved in planning within the department though they have been involved in planning the new laboratory.

Professional development
The technicians are encouraged to attend training courses and they have course information passed on to them. One technician is particularly keen to do the NVQ for technicians, but is having problems finding out how and where. Technicians are appraised.

Case Study 5: 13-18 comprehensive school set in a market town

The school is on a hillside with grounds sloping down to fields. It is located in a fairly large market town in an agricultural area. On one side the school is bounded by the town and on the other sides by playing fields. There are approximately 1200 pupils.

Science department

GCSEs and GCE A levels in biology, chemistry, physics and environmental science are taught and the department also offers AS and S level. GNVQ is also available.

There are nine laboratories. Two are in a new purpose built block approximately 200 yards from the main building, one predominately for A level physics and the other for A level chemistry. They have their own self-contained preparation room.

The other seven laboratories, in the main building, are general and serviced by one large preparation room. There is a rural science area separate from the main buildings where plants and vegetables are cultivated and small farm animals are kept. No equipment is required from the main laboratories since the area is self-contained. It has its own technician (full-time, term-time only). The science department also has a small computer room that pupils can use as a drop-in room.

One of the laboratories in the main building is on the ground floor. The others are on the first floor and are situated off corridors that more or less 'surround' the preparation room. All laboratories are similar in style with fixed benches around the walls, island benches with services in the centre and moveable tables around the islands. The one laboratory downstairs creates its own problems, with no lift meaning that equipment is carried up and down stairs. Where possible, equipment is duplicated to minimise movement.

The one preparation room for the main laboratories is a large square room. It has four doors into the laboratories or corridors leading to them. There is shelving around the sides that takes a mix of trays and equipment / glassware. There is a mix of benches and desks in the centre of the room for preparation and working. There is a small, lockable side room that is used as the chemical store and preparation area. The preparation room has recently been refurbished, before the laboratories.

Technicians

The science department has one full-time, whole year technician; one full-time, term-time only technician; and one part-time technician (3 hours per day). In addition, there is a technician for the rural science area. All can each cover the three sciences, although the full-time, term-time only technician is predominately physics based.

- Monday: two large sixth form practicals to be covered in the new laboratories. Four large practicals in the main laboratories. PAT testing in new laboratories.
- Tuesday: four practicals in main laboratories. Topping up / cleaning up in the new labs. More PAT testing. Targets set for the other technicians so that they can achieve a pay rise at the end of the year (assuming they have reached the targets). Targets are based on the NVQ for Laboratory Technicians. Written up risk assessments from schemes of work for another school who require help and who the head of department has agreed to support.
- Wednesday: eight practicals to set up in the main laboratories. Cleaning sinks and checking all equipment in new laboratories. Accident analysis completed for the whole school.
- Thursday: three practicals in the main laboratories and three in the new laboratories to be covered and cleared away. PAT tests written up. Washed and disinfected safety goggles. Shopping from town (cleaning materials etc). Started booking in some practicals for the next week. Full fire drill. Technician is a fire marshal and so had to be involved.
- Friday: visit made to the other school which the technicians are providing help for, to discuss risk assessments and to offer advice. Returned to school by 8.45 am. One practical which involved carrying equipment to and from new laboratory. Continued booking in practicals for the following week.

The above represents a quiet week because of mock exams taking place. Normally, many more practicals take place because the school operates on single periods; there are no double periods for practicals.

Laboratory safety checks on gas, water and electricity are carried out every month. Much book work and writing up of reports is done at home. Stock check is carried out in March each year and one big order placed before May to get full discount from Chemical suppliers. Index cards and a computer-based system are used for chemical stock.

Working practices

Teachers use a system of request sheets for equipment. Each sheet gives the name of the teacher and the date, time and location of the lesson for which equipment is required as well as a list of all apparatus and chemicals needed. When the apparatus is assembled the technicians put a 'what you have got' sheet with it. This not only tells the teacher what is provided but also lists the appropriate hazards that must be noted.

The request sheets must be in by Thursday. On Friday each week, the senior technician transfers the requests to the preparation room diary which shows each experiment for the day. From this the technician can assess the weekly workload for each technician and identify any classes that need to be switched to other laboratories for any reason.

For the new laboratories, the experiments are set out the previous day in the preparation room between the laboratories. They are set out on trolleys and staff wheel them into the laboratory as required. The technician goes to the new laboratories early in the morning to open up, at lunch time to clear and wash up and at the end of the day. Some equipment needs to be carried in trays from the main prep room.

Working relationships
The technicians find that some staff are very good and appreciate the work that they do, but not all staff are so inclined. The technicians are treated as part of the staff, but do not feel involved in the running of the department, although the head of science does recognise their importance. Technicians do not attend departmental meetings.

Professional development
The senior technician provides training for the other technicians. She has produced a training manual and each technician has a copy. It includes a sheet for each practical and lists 'how', 'what to do', 'safety hazards' and other relevant information. She is undertaking the NVQ level 3 for Laboratory Technicians.

There are few training courses offered, but some (eg health and safety) are offered by the county. Technicians have no problems in attending appropriate courses.

Technicians are appraised. The senior technician has also managed to instigate a personnel development system whereby the technicians are set a number of targets for the year. They are assessed against these targets and if they are successful then they will get a pay rise at the end of the year.

Case Study 6: 11-18 school in a city centre

The school is on one site very close to the city centre in a built up area. There are no playing fields around the school. The school has 950 pupils on roll. The lessons are one hour in length, with a maximum of 20 pupils in the class.

Science department

The science department covers standard grade, higher and advanced higher courses in all three sciences. It has nine laboratories, all being general purpose. One large preparation room services the laboratories.

All the laboratories are on the same floor surrounding the central preparation room and store and hence easy access is afforded to all laboratories. The laboratories are equipped with only basic equipment – test tubes, racks, Bunsens, tripods and basic glassware, etc. The rest of the equipment is then brought into laboratories as required from the preparation room and store.

All the laboratories are of the same size with a similar layout. This is a mix of fixed island benches carrying the services, and moveable tables which can be rearranged to suit a particular need. This might be for a practical class or for a tutorial set up.

The preparation room is large enough to have all the equipment and chemicals etc in one area. This helps considerably. There is plenty of room in the preparation room for all the trolleys (used for setting out practical requests) required to service all the laboratories and to be preparing for future lessons.

Technicians

There is one full-time senior technician and one assistant technician. There used to be more technicians but the provision has been slowly reduced. The week of the senior technician was as follows:

- Monday: discussion takes place with the assistant technician to plan the week's work. Check off delivery and deal with paperwork. Discussion with assistant headteacher concerning Wednesday's arrangements for visit to school by prospective ICT technicians. Shopping for biology practicals – fresh vegetables etc. Discussions with three Year 6 pupils concerning requirements for their projects. Tidying up some old paperwork for biology. Pouring agar plates.
- Tuesday: setting up and trialing new physics experiment for Higher Level. Collecting equipment and making up solutions to be sterilised. Tidying up alpha boards – in a mess from a class that was supposed to put them away. Setting up and trialing new Higher Level biology practical. Attend 5-14 subcommittee meeting. Pour more agar plates for Year 6 project.
- Wednesday: set up Standard Grade biology experiments. Year 6 project discussion. Two and a half hours looking after prospective ICT technicians, tour of the school, then a general question discussion with assistant headteacher, other ICT technician and network manager. Gather up some equipment to loan out to a primary school. Rest of the day spent on orders for physics.
- Thursday: technician currently has one morning off a week in lieu of holiday not taken last summer due to installation of new computer network. Afternoon spent sorting orders for biology.
- Friday: most of morning spent winding up orders for equipment and stock. Sort out masters for S1/2 science paperwork ready for the next rotation and write out requests sheet for reprographics. Discussion with assistant technician on planning for work for the next week. More discussion / preparation with Year 6 projects.

It was a very busy, exhausting and brain-draining week.

Working practices

Teachers fill in one sheet by the Friday for requests for the whole of the following week. The technicians can then plan and prioritise the next weeks' work. Most of the sheets come in on time with one or two exceptions. In these cases the technicians know what syllabus is being done and generally where the teachers are in the syllabus and so they have a pretty good idea of what is going to be asked for.

The equipment is put out on a trolley and wheeled into the appropriate lab for the lesson. These then have to be swapped around at the end of each lesson. Most of the time the system works, but it is difficult when only one technician is on duty.

Working relationship

The technicians are valued and staff know what the technicians do and are supportive. The senior technician is on the science subcommittee which comprises one teacher from each discipline plus the technician. The role of the subcommittee is to organise and implement the new first and second year 5-14 syllabus. The technician is fully involved with this development work.

The technicians do attend full departmental meetings and are part of the planning / development process in the science department.

Professional development

The technicians are encouraged to attend training and professional development courses. There is no problem in attending and funding is available. The main problem is finding appropriate courses in the area.

Case Study 7: Purpose built 13-18 comprehensive school

Built in 1968, the school was an amalgamation of four local village secondary schools. The area is a former mining community and for 5 years between 1995 and 2000 had Single Regeneration Budget funding. As part of regeneration of the area, the school had some funding towards the cost of a Territorial Army centre, sports and fitness centre with floodlit astro-turf pitches. A conference centre was also built.

Science department

The courses taught in the science department are: Spotlight Science (Years 7-9), Salters' Double Award Science (years 10 and 11), AQA A level Modular biology, chemistry and physics.

In 1996 the Middle Schools were abolished and this necessitated the building of a new block for science and technology and the conversion of the old science block to a mathematics block. The science department occupies the top floor of the building. It has twelve laboratories, one large preparation room, a curriculum base, office and a small tutorial room as well as two store rooms and a chemical store.

All the laboratories are on the same floor surrounding the central preparation room. It is in the centre of the floor space with a corridor all the way around it. The laboratories are situated on the other side of the corridor, around the outside of the floor space. There are doors leading from the prep room on each side to each corridor. This affords easy access to the laboratories, creating a minimum of travelling distance for equipment.

The preparation room has a portable fume cupboard permanently installed. One and a half walls are taken up with worktops with cupboards underneath. Another wall has bookshelves. Gratnell shelving racks are also provided for equipment storage. The centre of the room has U-shaped free standing work benches with Gratnell trolleys and trays underneath for storage.

The laboratories are furnished with identical fixed units to the preparation room with eight student tables. There are three mobile fume cupboards.

Technicians

There are two technicians, one part-time, term-time only working 27.5 hours per week and the other technician is full-time working 37.5 hours per week. The majority of the work is science based with very little time being spent on cross curricular work.

- Monday – Friday: the work load is very similar for each day of the week and it is difficult to separate out work into different days.

The technicians prepare, deliver and test out new practicals as well as looking after texts, TVs and OHPs. The technicians usually order equipment and chemicals.

The school day is divided into 6 lessons of 50 minutes each. Most of these are single lessons, although a few are double. There is one lesson in the week when only one member of the staff is teaching. The workload for the technicians for a 'typical' week is:

class practicals	66
teacher demonstrations	42
TV lessons	17
OHP requirements	8
small equipment requests	19

These are only the ones written on the order sheets. Extra items are taken without technicians' knowledge at the time and only come to light when found in the classroom later.

The equipment is set up on trolleys and then wheeled into the appropriate laboratory. It then has to be collected at the end of each lesson.

Working practices

Teachers are expected to order equipment on the order sheets by 11am for the following day (they should order only textbooks after the 11am deadline). In practice very few do. However, staff quite often put pressure on the technicians to give them practicals. Advance ordering for new items, assessed sixth form practicals and so on require longer notice.

The technicians do most of the departmental ordering, although it is countersigned by the head of department. The technicians deal with all petty cash transactions. Booking of school science trips is generally organised by the technicians.

Working relationships

Usually the technicians do not attend departmental meetings unless there is a specific need. In general, the working relationship is good between staff and technicians although the technicians feel that the teaching staff rarely have any comprehension about how the technicians do their job.

Professional development

There is a technicians' support group in the area that organises INSET courses which the technicians are allowed to attend. CLEAPSS courses have also been attended. Only one technician is allowed on a course at any one time. There appears to be no planned professional development.

Case Study 8: Independent high school situated in a city suburb

The school, built in the 1960s, is situated in a pleasant suburb of a major city.

Science department

The science department offers the usual courses from GCSE Double Award science to GCE A levels in biology, chemistry and physics.

There are seven laboratories situated on the second and third floors of the building: two biology, two chemistry, two physics and one general science laboratory. There are preparation rooms adjacent to, or close by, each pair of laboratories and a technicians' staff room with lockers, fridge, sink etc. There are two chemical stores: one for general use and the second for flammable materials and chemicals. The stores are located adjacent to each other on the third floor. There is a computer in the staff room.

The laboratories are on two floors. The physics and general science laboratories are on the second floor. There are two preparation / store rooms, one situated between the two physics laboratories and the other adjacent to general science.

The biology and chemistry laboratories are on the third floor. There is one preparation room adjacent to one of the biology laboratories. There is access from one biology laboratory through to the other. The chemistry preparation / store rooms are opposite the chemistry laboratories.

The basic layout of the laboratories does vary from laboratory to laboratory. One of the physics laboratories has traditional fixed benches in the centre facing the teacher's bench at the front. These benches have services on them. The other physics laboratory has moveable benches in the centre with services only on the fixed benches around the walls. The general laboratory has island benches with gas and electricity, with fixed benches around the walls with water and electricity. The two chemistry laboratories have six fixed benches in the centre with gas only. Other services are then on the fixed benches around the walls. A similar arrangement exists with the biology laboratories except that the centre benches have electricity as well as gas.

There is a goods lift between the floors that provides access to the laboratories. There is also a separate passenger lift.

Technicians

There are two full-time (52 week) technicians and one full-time, term-time only technician (also works as an IT technician). One of the full-time technicians serves biology and the other full-time technician together with the term-time only technician covers chemistry and physics. There are ten members of the teaching staff.

All the laboratories are occupied for most of the week and it is very difficult to get into them to do regular cleaning. Most apparatus has to be moved before lessons start, at break or dinner times. For four days a week lessons start at 9.20 am and finish at 3.50 pm (8 periods of 35 minutes). On the other day, lessons start at 8.50 am until 3.50 pm (9 periods of 35 minutes). The technicians usually take mid-morning breaks before the school break and then start lunch break during the last lesson of the morning in order to take advantage of the free time in the labs during the school lunch break. A typical workload followed each day is:

Arrive at school between 8.00 am and 8.10 am (officially start at 8.30am). Check the lesson needs for the first two double lessons. After preparing or moving apparatus, the technician usually checks the mail or any other communication from staff. The TV/VCR requirements are then checked for that particular morning and then moved to their required labs. There are eight TV/VCR's in the school and sometimes all eight are needed. By this time lessons have usually started and so preparation for the remainder of the morning lessons can start. There may also be video recordings to set up. The mid-morning break is then due and the time to move apparatus for the rest of the morning lessons. Lunch is taken at 12.00pm, usually for one hour. Then the laboratories are cleared and re-equipped for the afternoon lesson starting at 2.05pm. The afternoon is spent writing orders, doing repairs, making solutions for lessons later in the week etc. Afternoon break is taken between 3.15 and 3.30 and then it is back to the laboratories to clear away equipment from afternoon lessons.

One technician is also responsible for all PAT testing in the school. She is also requested to deal with any problems concerning the TV and VCRs (arranging servicing as required). The technician also serves on the school health and safety committee which meets at lunchtime.

Working practices

Requisitions for practical work are given in varying ways. There is no common method. They may be written in exercise books, on individual sheets, put in a shared book (as is the case in biology) or even sometimes by word of mouth. Notice can be as long as a week or as short as a few minutes despite efforts to standardise to any particular time such as 72 working hours notice. However, most staff are very co-operative.

Working relationships

The staff are easy to get on with and are very helpful and co-operative if one of the technicians is absent. There is one full science staff meeting per year and in addition, individual subject meetings are held periodically.

The technicians are not invited to any of the individual subject meetings but are invited to the full staff meeting. There is a feeling that senior management does not really know or maybe care enough about technicians. They seem to be very remote.

Professional development

The technicians are not appraised. They have no job description and, as a consequence, there is no planned professional development. Technicians are allowed to attend INSET courses but it is on an *ad hoc* basis.

Case Study 9: Tertiary college, located predominately on one site

This incorporated further education college is situated mainly on one site on the outskirts of the town centre. The college uses various 'outreach' centres and has a separate site for engineering.

Science department

The science department caters for both full and part-time students on a wide range of academic and vocational courses from GCSE Combined Science and Human Physiology & Health to an HND in Environmental Conservation. Provision is also made to support the first year of a combined studies degree for a local university. A number of other subject areas, including archaeology, electronics, engineering and geography also make use of the science facilities.

The science department is located on a single floor on the college main site. Three years ago the science department made the transition from eight traditional dedicated specialist laboratories, serviced by four preparation rooms and their associated full-time technicians, to an open plan science workshop with dedicated work areas. Apart from the odd demonstration, all practical work takes place within the workshop. Here, there is a single preparation room and a separate office area, manned by one full-time and two part-time technicians.

The science department occupies a single floor. At one end of the department there are three teaching rooms (no laboratory facilities), and an optics room. A single door separates this from the science workshop or practical area. Within the workshop are: four specialist dedicated practical areas – two 'dry' areas, one 'damp' and one 'wet' area – associated with vocational science, physics/electronics, biology and chemistry respectively; one IT area (with 20 computers); the technicians office; and the preparatory room. Each specialist area has fixed grouped benching and work areas have tables. On leaving the department at the far end, there is a further teaching room which contains a fume cupboard for demonstration purposes and a separate dry and wet chemical store.

Equipment is easy to move on trolleys, but storage is a problem. The science staff room is the only part of the provision that is housed on a separate floor.

Technicians

The science department has one full-time and two part-time technicians. One technician covers physics and the other two support both biology and chemistry.

The technicians supervise all practical lessons, leaving the lecturers to lecture. This has been a major culture shift within the organisation. This year, for the first time, numbers are so high that lecturing staff have had to cover some practical classes. Lecturers decide what each practical session should consist of and prepare worksheets etc. They also mark any practical homework. The technicians set up, supervise and clear away each practical. Technicians prepare for evening classes by setting up practical work, but they do not have to stay to support them.

Workload varies from week to week, but the technicians are always on call with breaks being a bit "*hit and miss*". One technician has specifically been employed to cover 10am to 2pm to enable the remaining staff to get a break. "*Our open plan practical area must be manned at all times both for safety and security reasons.*"

The laboratory manager (full-time technician) has a flexible contract that is split 50:50 between technician work and demonstrator / manager / cover support.

Working practices

Practical request sheets are usually submitted 24 hours before the practical is due to take place. Generally though, lecturing staff provide the technicians with their requests the week before. The technicians are responsible for ordering stock, but any item over £30 must be approved by the head of science.

Working relationships

Generally the technicians have excellent working relationships with the staff, although one technician felt that they were occasionally taken for granted. The technicians are invited to science team meetings and feel fully involved in the running of the department.

The technicians also felt that they had an excellent rapport with the students. With no marking, but contact with the students during practical sessions, the technicians were able to devote more time to individual students needs.

Professional development

The technicians had few items on their wish list for professional development, but to summarise:

- one technician is currently studying for a degree with a view to perhaps becoming a lecturer in due course. The ideal situation would be a 'half way house', with more money reflecting extra responsibilities but not preparation and marking – basically a career structure for technicians with a recognised qualification at the end;
- basic physics: setting up equipment;
- risk assessment;
- dissection: issues for demonstration;
- forum for technician chats, eg topics such as drug awareness, security of equipment, motivating students and classroom management would be of interest to this team. These topics perhaps reflect their enhanced role within the science department;
- two technicians are studying for a teaching qualification and one of the part-time technicians lectures in 'Application of Number'.

Case Study 10: 11-18 comprehensive in a city

This comprehensive, with approximately 1400 pupils on roll, is in a built-up area of the city. It is near to two other schools but does have playing fields adjacent.

Science Department

GCSE Double Award Science and GCE A level biology, chemistry and physics are taught. The department ran GNVQ science until 2 years ago. They stopped not because numbers were low but because of the amount of work involved and inconsistent results.

The science department has eleven laboratories, each designated to a teacher who teaches in them the whole time. All teachers teach the three sciences of biology, chemistry and physics and hence all three sciences are taught in each laboratory. There is some swapping of classes to accommodate A levels; for example, A level chemistry tends to be taught in laboratories on one floor because specialist equipment is stored there.

Four preparation rooms service the laboratories: two smaller ones which tend to be used as stores for equipment and two larger rooms where all preparation work is carried out. The laboratories are sited on three floors. Up to GCSE level is taught on all three floors in all laboratories, A level chemistry is in laboratories on one floor, and A level biology and physics are on the other two floors.

The laboratories tend to be located around a central stair well. Three are on the second floor together with a staff room. There are four on the first floor together with one large prep room. Two of these and the preparation room are located around the stair well. The other two laboratories, in a new block completed a few years ago, are accessed from one side of the preparation room. There are four ground floor laboratories and mirror those on the first floor, with two in the new block.

Five laboratories have hexagonal fixed benches each with services. The other labs are fitted with centre 'pods' containing the services and moveable tables that can fit around the pods. Two of the laboratories are very old; one of these is being refurbished this year with money from a government initiative for which the school had to bid to the Local authority. There is a chemical store adjacent to the preparation room on the first floor. All laboratories are equipped with basic items only, eg commonly used glassware. The rest of the equipment has to be kept in the preparation and storerooms for safety.

The preparation rooms used to be almost small 'corridors', but since limited refurbishment two classrooms have been turned into preparation rooms. These are the large preparation rooms, fitted with workbenches in the centre and fixed benches around the walls with the services. There are storage cupboards above the fixed benches. A fume cupboard and free-standing storage cupboards complete the layout. The technicians had a large say in refurbishment of the preparation rooms. There is a 'dumb waiter' to carry equipment between the floors.

Technicians

The science department has three technicians, each one assigned to a particular floor. The technicians work closely together. There is a senior technician (27 hours per week for 40 weeks, term-time only). The other two are also term-time only with one working 35 hours per week and the third for 15 hours per week. The senior technician has an HNC in chemistry, one technician has a degree in biochemistry and the other is a State Registered Nurse.

•Monday – Friday: all days are similar. The technicians work 24 hours ahead. The first job in the morning is to collect the equipment request sheets for the following day. From these request sheets, the appropriate worksheets have to be sorted and tracked. The worksheets indicate the resource requirements for that practical work. The practicals are then sorted and prioritised and the equipment needs are put out onto trolleys for each class. On a busy day this can occupy all day.

Technicians fit in the other jobs when a spare moment is available. This includes repairing of equipment, paper work, ordering, stock control and so on.

Occasionally technicians will be involved in the classroom if a demonstration, or some aspect of the working of pieces of equipment have to be explained to pupils.

Working practices

Teachers use small equipment request sheets to book practicals and equipment. These sheets give date, period, group, teacher and room number, the practical / resource requirements, number of sets and date of repeat (if applicable). In most cases the equipment / resource requirement just takes the form of the scheme of work reference number of a code number.

The teachers complete the request sheets and pin them on a notice board in the staff room. The technicians collect the sheets on the following morning. Generally the system works well.

A trolley system is in operation with the equipment and resources set out on trolleys and labelled; mostly, the teachers then collect their own trolley from the preparation room.

Working relationships

The technicians enjoy excellent working relationships with the staff. They are included in all the decision making in the department. They have the option to attend departmental meetings and to raise items on the agenda. They certainly feel a valuable part of a team. The senior technician looks after the departmental budget, produces spending plans and presents them to the head of science.

As mentioned above, one of the laboratories will be refurbished this year. The senior technician was asked to design the laboratory and organise its development. This included discussions with, amongst others, the architect and builders to produce contracts. The senior technician will follow the project through to completion.

Professional development

If the technicians relied on the school for training then it might be that nothing would be done, since it appears that little paperwork and course information gets through to the technicians. However, technicians from four schools in the area instigated a technicians' forum that meets regularly for activities. The four senior technicians meet and organise training programmes. The forum has now extended to all schools in the area. It organises one major training day per year, usually in April. Topics covered have included electricity competence certificate, data logging and computer training. Also included will be topics of relevance such as new initiatives and their effect on technicians. The training days are organised to coincide with school INSET days so that all technicians can attend.

Case Study 11: City Technology College in a large town

This City Technology College is situated on two campuses separated by a main road. A footbridge for students links the two campuses. The science department is all situated on one campus. The college has approximately 1300 students on roll.

The science department caters for a range of courses including GCE A levels in biology, chemistry and physics, GNVQ advanced science (now AVCE), GNVQ intermediate science. Key Stage 3 pupils study Spotlight Science and the majority of Key Stage 4 pupils study NEAB modular science with the remainder doing GNVQ intermediate.

The science department

There are 12 laboratories. One laboratory is kept primarily for physics being near to the physics prep room. Another 2 laboratories are dedicated GNVQ laboratories, which have a rolling door separating them such that they can be made into 1 laboratory if required. A small room at one end serves as a computer suite for GNVQ students doing project work. The rest of the laboratories are general laboratories covering all three sciences.

The laboratories are on 2 floors, all in one building except for 1 laboratory that is outside the main building. There is a lift between floors. The technicians use a lot of trolleys to transport equipment between laboratories and the layout provides easy access with no steps or difficult entrances. The only problem is through doors to the outside laboratory.

There is a mixture of laboratory layouts. Some laboratories have octagon style benches, some with traditional fixed long benches with services with the rest having island benches with services and moveable tables up to the islands.

There are three preparation rooms. One is dedicated to biology and one to physics. The third room is a large preparation room which stores prepared trays of experiments on racking. It also acts as the store for glassware and also contains the dishwasher. There are two additional storerooms, a chemical store inside and bunkers outside for flammable chemicals. There is an office for the senior technician and for the storage of Spotlight worksheets etc.

Technicians

The department should have 5 technicians but one has recently left. The college are replacing this technician, have advertised once but received no suitable applicants. All the technicians are full time in terms of hours per week (37) but have a mix of weeks in the year. One technician is full time all year.

A typical working week for the senior technician could include the following:

- Chasing up requests for equipment that have not been submitted by the due time.
- Getting practicals ready for both A levels and GNVQ classes.
- Carrying out ordering of equipment and materials.
- Selling revision guides to students at appropriate times.
- Clearing away of practicals.
- Could be investigating a problem regarding experiments or techniques.
- Could be in the classroom with the teacher acting as a second pair of eyes and hands for safety reasons or demonstrating the use of equipment and techniques to groups of students.
- Preparation of practicals for the following day.
- As most of the laboratories are for all three sciences equipment has to be transferred between laboratories. Hence the use of trolleys. However, sometimes with the use of larger items of equipment the classes could be changed between laboratories.

Working practices

The department uses a system of A3 request sheets. These have all the periods of the week listed and each member of staff is expected to complete one of these for their equipment requests for the week. These should be with the senior technician by 5.00 pm the previous Thursday (though this does not always happen).

At the beginning of the year the senior technician will have allocated lessons to each of the technicians based on getting the right expertise in the right place. This is reassessed periodically through the year.

The technicians have A4 workbooks and each week they go through the A3 request sheets and lift off the particular work for their lessons into the workbook. Each technician prioritises their own work. The senior technician carries out all stock control of chemicals, equipment and materials from information provided by the technicians.

Working relationships

The technicians have excellent working relationships with the staff. They are regarded as a part of a vibrant team. Departmental meetings are held once a week and the senior technician attends all meetings even though they are after school and outside her working time. Other technicians attend the meetings when relevant. The technicians can make suggestions regarding, for example, organisation of the timetable etc.

Professional development

Each technician is given 10 days of paid INSET at the start of each year. The technicians have an appraisal each year that starts with a skills audit. Three development plans are produced, one for the college, one for the department and one for technicians (produced by the senior technician). The plan covers four areas: innovation; raising standards; customer; business.

From the skills audit, training needs for technicians are identified to match the development plan. The training needs are passed to the professional development co-ordinator who will match the needs to available courses. Technicians are free to go on courses providing work is organised. The training targets are reconsidered through the year and updated through to the next appraisal.

Case Study 12: 11–16 comprehensive school in a market town

The school is situated on a single site on the outskirts of the town. It has approximately 650 pupils on roll.

The science department

The science department caters for a range of science courses. These are NEAB modular science for years 10 and 11, Spotlight Science for years 7 and 8 and for year 9 the science department uses its own science schemes of work.

There are 6 laboratories, originally designated as 2 each for biology, chemistry and physics. However, now, teachers are given a laboratory and do all teaching in the one laboratory and have to teach all science subjects. Hence the laboratories are now general covering all three sciences.

There are two basic designs used for the laboratories. Two (the old physics labs) have fixed benches with gas and electricity around the outer walls with moveable tables and chairs in the centre. The other four laboratories are being refurbished and will have hexagonal structure benches with services. The benches will be fixed.

The laboratories are all on one floor but two are in one building and the other four are in a separate building, across a quadrangle with steps down from one and up to the other. A further room will become a resource centre for computers and books.

There is one 'preparation room' in between the two physics labs but this is used only as a store room for physics equipment since it also serves as the staff room. The one real preparation room is in the other building with the four labs. It is a spacious preparation room having been reconstructed, with space for racks for storage and sinks and work tops for preparation.

Technicians

The science department has two technicians but both are part-time, term-time only. One technician works four days a week and the other technician works 3 days a week. The department used to have a senior technician who was full-time all year, however, on leaving the school was only replaced with a part-time technician.

Both technicians service all laboratories across all the sciences; they do not specialise. The workload is particularly heavy with practicals every day and during all periods. The technicians' time is taken up wholly with preparing practicals, clearing away and washing up. Also, workloads must be organised for the days when the technicians are not present due to the part-time role.

A system of trays/trolleys is used for practicals and equipment that are wheeled in and out of laboratories. The trays are not pre-prepared in terms of sets of equipment for an experiment. The trays are used for the requested number of items. Basic equipment (beakers, Bunsen burners etc) is kept in cupboards in the labs and students help themselves. Equipment and materials must be carried up and down the steps between the two buildings.

There are times when the workload of practicals is so heavy that materials and equipment for a particular lesson may not be quite ready for the start of the lesson. In this case teachers would start the lesson and then revert to practical when the materials arrived. The staff are very understanding of the situation and support the technicians fully.

The department would welcome more technician time in order to carry out other essential tasks. These include, importantly, safety checks on equipment which should be done each term but cannot be because of lack of time. At the moment safety checks are only visual. The necessary paperwork for these gets neglected. Further, more time could be spent on the repair and maintenance of equipment.

Working practices

The technicians use a system of 'order' forms for equipment and materials requests. These ask for staff initials, date, year/class, period and laboratory, together with the requirements. The completed forms are then placed in the prep room in a slot for the appropriate day/period. Either technician will then remove these forms and act on them accordingly. The requests should be in place one week in advance. For any unusual requests that needs buying or making an additional three days notice is requested.

Working relationships

The technicians have excellent working relationships with the staff. They are regarded as a part of a team and included in everything to do with the department. The technicians are consulted over practicals and equipment regarding the possibility of doing a particular experiment. They may go to department meetings if relevant issues need addressing.

Professional development

The technicians are able to attend INSET courses if appropriate. There appears to be no limit on the number of courses that they may attend. Usually only one technician is allowed on a course at any one time unless it is of particular importance, for example, health and safety. However there is no planned professional development. Course information readily reaches the technicians.

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The Royal Society

The Royal Society is the world's oldest scientific academy in continuous existence, having been at the forefront of enquiry and discovery since its foundation in 1660. The backbone of the Society is its Fellowship of the most eminent scientists of the day elected by peer review for life and entitled to use FRS after their name. Throughout its history, the Society has promoted excellence in science through its Fellowship, which has included Isaac Newton, Charles Darwin, Ernest Rutherford, Albert Einstein, Dorothy Hodgkin, Francis Crick, James Watson and Stephen Hawking. The Society is independent of government, as it has been throughout its existence, by virtue of its Royal Charters. The objectives of the Royal Society are to:

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- encourage research into the history of science.

The Association for Science Education

The Association for Science Education (ASE) is the professional association for teachers of science, laboratory technicians, advisers, lecturers in universities, industrialists, and others contributing to science education. The Association has over 20 000 members and supports those teaching science from primary to post-16 education and their professional development. ASE is a registered charity, financed by members' subscriptions, and receives no government funding. The Association's principal aim is to support and develop quality in science education, which it does in a variety of ways, including the publication of a range of journals. The Association holds meetings both locally and nationally and its Annual Meeting attracts up to 4000 delegates over a three-day period.

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