Topic 3: Science Technicians

This *Topic* (dated July 2016) is an updated version of *Topic 3*, which appeared in the 3rd edition of *Topics in Safety* (ASE, 2001). There are a few minor changes throughout, most notably in section 3, which contains updated information on risk assessment and technicians.

3.1 Introduction

The science team comprises the head of science, teachers and technicians all of whom have a role in health and safety. Communications among team members are vital but not always simple. A department needs communication systems which enable all views to be heard and valued equally.

Technicians often deal with larger quantities of materials and, usually, heavier loads than teachers or students. Their health and safety can be at risk if they rush their work, suffer constant interruptions and work in cramped conditions.

3.2 Communication

3.2.1 General

Technicians should have access to the employer's and departmental health and safety policies. They should also be provided with information concerning relevant health, safety and welfare issues that the department and teachers receive from employers and professional bodies such as the ASE, CLEAPSS or SSERC.

Technicians should be given access to, and taught how to use, both model (general) and any special risk assessments endorsed by their employer.

Technicians should be given the relevant training to work safely in accordance with health and safety policies.

3.2.2 The technician at departmental meetings

Technicians should be encouraged to be present at departmental meetings (see *Topic 1*) especially when the health and safety policy or particular health and safety matters are discussed. If meetings are after the technician's day ends, heads of department should consider a flexible working hours arrangement or perhaps even arrange paid overtime. Minutes of meetings should be available for those technicians who are not present.

Heads of department should try to arrange departmental meetings when all members of the department can attend. If this is not possible, any items which are of specific concern to technicians should be dealt with when they can be available. Technicians should feel that they can be proactive in these meetings and, if they have any items of concern, these should be included on the agenda, not relegated to any other business at the end of the meeting. When a new course with new practical work is being planned, the involvement of technicians can be invaluable in highlighting areas where health and safety issues may arise for themselves, students and other staff, on the availability of resources and the need for any further training. Items that involve health and safety to which technicians can contribute in departmental meetings are listed below.

- How proposed alterations to the departmental health and safety policy could affect technical staff.
- Ways in which experimental procedures can be altered to solve practical problems.
- Effects on technicians' safe-working practices brought about by alteration to the timetable.
- Accidents or incidents that could have resulted in an accident which a technician has witnessed.

- Problems in the day-to-day working of the department which may affect a technician's health and safety such as late requests or laboratories left in a hazardous condition.
- Resourcing a new course, syllabus or teaching scheme.
- State of equipment (e.g. safety spectacles) and materials in the laboratories.
- Updates on loss of equipment (e.g. scissors) and materials (e.g. magnesium ribbon) through theft.

3.2.3 Technician issues that a head of department should be aware of

a) Technicians must have access to personal protective equipment (see *Topic 5*). This should include:

- comfortable and appropriate eye protection[1];
- appropriate protective gloves;
- laboratory coats for dealing with radioactive or microbiological material[2] and when handling and dispensing large volumes (e.g. 2.5 litres) of hazardous liquids;
- a face shield;
- a face mask of the appropriate standard if deemed necessary (e.g. dealing with spores or fine wood dusts).

b) Heads of department should be aware that technicians are put in a difficult position if they are given instructions which, in their view, may affect their personal health and safety, such as being asked to monitor classes or look after individual students. The latter can occur during lunch times when technicians are particularly busy. The head of department may have to act as an arbitrator if a technician has to say 'no' to a teacher for reasons of health and safety.

c) Technicians should have a clean, healthy and safe working environment. They are entitled to take breaks as stated in their contract.

d) Technicians should have regular appraisal/review meetings to discuss their continuing professional development and training needs to ensure that they are fully up-to-date on health and safety. The head of department should ensure that technicians receive the relevant training.

e) Teaching staff should make it clear to students that instructions involving health and safety from a technician carry the same weight as from a teacher. For example, a technician, seeing a student not wearing eye protection, may ask the student to wear the protective equipment correctly.

There is much useful health & safety advice on the internet, e.g. from CLEAPSS and SSERC. Where internet access is not available in prep rooms, an urgent case for improvements in computer facilities should be made to the head of science.

3.2.4 The new technician

An induction programme must be in place so that a new technician is integrated quickly into the department and is fully aware of all health and safety procedures. A departmental technicians' file[3], which should include items as listed below, could be used to ascertain the training needs of the technician. See also CLEAPSS guides DL228/G228 *Technicians and Their Jobs* and G234 *Induction and Training of Science Technicians.*

- Reference to the employer's health and safety policy.
- Departmental health and safety policy (which includes emergency procedures).
- Job description - which should detail what is expected of a technician.

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[1] Prescription lenses may be desirable. A face shield will give legally required protection.

[2] For protection of the cultures, not the wearer.

[3] *The Prep-Room Organiser* (ASE, 2007) is useful in this situation. ISBN 978 0 86357 416 0

- Line management structure.
- Lines of communication.
- Preparative procedures.
- Procedures within the department.

New technicians need to work under supervision until they have demonstrated their competence at various procedures.

3.3 Risk assessment and technicians

3.3.1 General

Technicians may be able to make a valuable contribution towards the adaptation of risk assessments for science activities. However, technicians are only responsible for the risks posed by their own activities and not those carried out by teaching staff and pupils. Technicians should be able to access model risk assessments endorsed by their employer. Special risk assessments should be obtained (from CLEAPSS or SSERC) for any procedure not covered by model risk assessments. Technicians should have easy access to the schemes of work, practical worksheets and any published teacher/technician guides. Teachers should alert technicians if they are requesting unusual practicals that do not appear in such documents. In this case, procedures need to be checked against information given by CLEAPSS and SSERC.

Access to the internet has made a wealth of other information easily available to technicians, some of which is not at all reliable and should be viewed with caution. For example, safety data sheets provided by manufacturers, sometimes referred to as MSDSs, can readily be found on-line. Such information does not, however, constitute a risk assessment and should not be used as such.

It would be good practice for technicians to write up those procedures which they use on a regular basis to avoid repeatedly looking up information. A portfolio (technicians' file) of useful information could be assembled and updated or amended as new information becomes available. Time should be made available to complete these tasks.

3.3.2 Lone working

Lone working occurs when there is no other employee present in the same building or even on the same floor as the working technician. If technician numbers are reduced, working practices need to be reviewed. Occasions when technicians find themselves working alone can be:

- at the very beginning and end of the day;
- during school holidays;
- during lunch times;
- when teaching staff are occupied away from the department.

Certain laboratory procedures and manual handling operations, as agreed beforehand with the head of department (after a suitable and sufficient assessment of risk), should not be carried out during these periods. For example, the bulk dilution of concentrated acids and alkalis or the moving of heavy objects from one floor to another. Accidents can and do happen even to experienced technicians and in such circumstances, they must have rapid access to help. Doors locked from the outside to prevent intruders could inadvertently delay assistance reaching the technician.

3.3.3 The handling of heavy items and large quantities of materials

During much of their work, technicians, unlike teachers, often have to cope with heavy and bulky materials. Table 1 highlights areas that are of concern and need to be addressed through discussion and training. Manual handling issues are fully dealt with in *Topic 4*.

Table 1 Technician activities with large quantities of materials

Operation	Notes of particular importance for technicians
Disposal of hazardous materials	Technicians may be required to dispose of the combined waste of several experiments carried out during the day. The disposal of hazardous chemicals and biological materials should follow the guidelines of the employer's policy. See *Topic 11* for advice. Help should be obtained when confronted with unusual chemical names or bottles in poor condition. The technician should be made aware of any hazards that might occur during the cleaning of equipment at the end of the class practicals or demonstrations.
Handling of hazardous gases, liquids and solids	Technicians may be required to prepare, for example, 2.5 litres of dilute acid or several gas jars of chlorine. Full use should be made of personal protective equipment as indicated in the employer's risk assessments. See *Topic 5* for advice. Technicians should seek advice and instruction if such procedures are being carried out for the first time.
Handling of pressurised gas cylinders	Technicians may be required to move and handle cylinders of various gases. Instruction should be undertaken when using a gas cylinder for the first time.
Transporting heavy equipment, books etc.	Technicians may be required to carry, for example, a 2.5-litre bottle of concentrated acid, or several large pieces of equipment, from one area to another (possibly up and down stairs). Full use should be made of specific procedures and mechanical aids as indicated in the employer's risk assessments. See *Topic 4* for advice. Technicians should seek training in manual handling techniques.

3.3.4 Dealing with requests for equipment and materials

It should be departmental policy that requests for materials from teachers are given to technicians as early as possible and normally no later than two working days before the activity. Some schools have a policy that requests for the following week should be made by the Thursday of the preceding week. This allows the technician time to organise visits to local shops to collect material and/or carry out time-consuming preparative procedures.

Although a technician may understand that a late request from a teacher can sometimes happen, it should not be a common occurrence.

Teachers should always pay attention to the health and safety implications of any requests they make of a technician. In particular, when considering making requests at short notice, or asking for jobs which are not really the technician's primary role, remember that both will put pressure on time and compromise health and safety. Teachers should ask themselves the following questions.

- If the technician does this job, what will he/she have to leave to do it? e.g. disruption of other classes.
- If the job the technician has to leave is then rushed, could this cause an increase in risk to his/her health and safety?
- Is the job I am asking the technician to do more important than the job he/she is presently doing irrespective of who has asked him/her to do it?
- Is the job I am asking the technician to do really a technician's job?
- Has the technician the qualifications/experience to do the job safely?

If the risk assessment and procedure indicate that to carry out a requested procedure in the time available would constitute an unnecessary risk, the technician would have to say ‘no’. In this case teachers should respect this right.

3.3.5 Tidying up

Practicals which may present little risk in setting up can present more serious risks to the technician when being cleared away. Teachers should deal with hazardous residues where possible or ensure that technicians are well aware of any hazards before clearing up. Practical worksheets used by students should, if appropriate, have a section on clearing up procedures. Some examples of problems that technicians encounter are given in Table 2.

Table 2 Examples of problems encountered in clearing up students’ practical work

Activity or equipment	Problems encountered	Control measures
Activities involving heating	Burns when handling hot equipment.	Technician to be informed if any equipment is hot (e.g., beakers, tripods, soldering irons). Use heat-proof gloves if waiting for the items to cool is impossible.
Demonstrations with alkali metals	Washing equipment with water may produce fire and/or explosions.	Ensure the complete reaction of any metals on knives, tiles, etc., by placing these in water after their use.
Glassware	Students mixing broken glass with other waste. Technicians or cleaners can be cut.	Students should be made aware of the hazard of broken glass and encouraged to report any breakages. The teacher or technician should deal with breakages as quickly as possible by placing broken glass in a separate bin.
High-voltage equipment	Items could be left charged e.g. Van de Graaff generators. A static discharge can be given to the technician.	Teaching staff to discharge the equipment before leaving the apparatus.
Microbiological experiments	Contaminated equipment in normal washing trays.	Staff should ensure that correct procedures are used by students. Technician must wear a lab coat.
Open-ended activities	Reactions between chemicals during washing up, producing harmful or toxic gases.	Teachers should be aware of these situations and provide suitable information if equipment or materials are left out overnight or require washing or disposal.
Returning class sets of scalpels, syringes or other hazardous equipment	Technicians can receive cuts from sharp objects.	Teachers should ensure that all hazardous equipment is returned to the correct containers.
Use of concentrated chemicals	Chemical burns. Toxic effects.	Students should follow the established procedures for clearing away contaminated glassware. Technicians should wear adequate eye protection and, if necessary, gloves when clearing away chemicals.

Both technicians and teachers have a duty of care to the cleaners, whose health and safety should not be put at risk by leaving broken glass or other hazardous materials in rooms or general waste bins which are cleaned or emptied every evening. (See *Topic 11*).

Any equipment that needs to be left out overnight should be suitably labelled if it presents a hazard.

3.3.6 Trying out or researching practical activities

When asked to trial new practicals or solve practical problems that teachers are experiencing, the technician should discuss the risk assessments with the teacher. If the practical is unusual in any way, then expert advice is available from various organisations such as CLEAPSS and SSERC. Technicians should record any further unanticipated hazards they encounter whilst conducting the practical, and communicate their findings back to the teacher.

3.4 Technicians in lessons

3.4.1 Introduction

There are many occasions on which a technician would need to be present in the laboratory during a lesson. A primary task of the technician is to facilitate practical work by preparing materials and equipment. This will often necessitate the technician entering the laboratory during lesson time in order to deliver and collect materials for class use or to retrieve items stored within cupboards. They may also be present at the request of the teacher to provide missing items of equipment and to check faulty items of apparatus during a practical session. A technician present in a laboratory during a lesson who notices a health and safety issue has a duty of care either to speak to those concerned (especially if it is urgent) or to alert the class teacher, who should then address the issue.

3.4.2 Working with students in the laboratory

Heads of department should encourage the participation of technicians in lessons involving practical work. Being present in the school laboratory while practical activities are in progress offers technicians the opportunity to see how materials and apparatus are actually used by pupils and so can increase the technician's awareness and understanding of difficulties that pupils typically face in the course of their practical work.

If the head of department considers that a technician is required to be in the laboratory during a practical session, clear guidelines should be given as to what is required in terms of input, e.g. showing how to use the equipment, but not helping with worksheets; supporting students undertaking extended practical projects, but not taking responsibility for the supervision which remains with the teacher.

Technicians should not be expected to run practical sessions in a laboratory on their own.

Students should respond to safety instructions from a technician in the same way as they would from a teacher.

SSERC recommends that chemicals supplied to pupils for project work should be signed out and in. Schools in Scotland can find guidance on pupil supervision from SSERC. (http://www.sserc.org.uk/index.php/supervision-of-project-work)

3.4.3 Demonstrating during lessons

Technicians are sometimes asked to demonstrate to students procedures such as aseptic technique for plant tissue culture, titrations, use of microscopes and balances, particular chemical reactions, data collection, etc. A risk assessment, if required, should be provided before the demonstration takes place. Technicians should only demonstrate to students with a member of science teaching staff present and if they have rehearsed the procedure.

3.5 Health and safety in the prep room

3.5.1 Introduction

Technicians work in the prep room for the majority of their time. This environment must always be a healthy and safe place in which to work and also for visitors. Teachers might enter the prep room to talk to technicians and possibly carry out their own practical work (if laboratories are otherwise occupied and the prep room is large) but, it should not be used as a teaching staff room. Students may visit the prep room to collect material for a teacher but they should not be encouraged to enter the room. On display may be expensive balances and hazardous chemicals which may be a future target for theft. The practice of leaving students in the prep room to complete an exam or class test with only a technician in attendance must be discouraged.

3.5.2 Space

A recommended area for a prep room and storage space is given by the formula[4]:

Area of prep room and storage area =

number of student places in the science rooms x (0.4 to 0.5) m^2

(For a school with six laboratories, each holding 30 students, 72 - 90 m^2 of prep room and storage space are needed.)

There should be adequate and appropriate storage for chemicals, glassware, other equipment, books (related to the technician's work) and space for both prepared and returned practicals. The aim is to avoid obstacles preventing free movement about the room. Bench height should reflect the fact that adults work in this room and not students. In addition, technicians should not be expected to work at sinks in a stooping posture for long periods. (See *Topic 6* on laboratory and prep room design for health and safety.)

3.5.3 Environmental issues

The prep room should be warm enough during cold weather, cool during hot weather, and well illuminated. There should also be adequate ventilation (at least 5 air changes per hour[5]) and a ducted fume cupboard if the prep room is used for chemical preparation[6] (see *Topic 7*). There should be a clear space for dealing with all the paperwork and the prep room computer and telephone, preferably not near a wet area.

Prep rooms should ideally have two sinks: one for washing equipment and disposing of chemicals and the other for washing hands and possibly eyes in case of an accident.

3.6 Equipment safety testing

Technicians are often required by their employer to carry out tests on equipment. They should be suitably trained before carrying out this activity and given adequate time. There should be no attempt to repair any faults found by testing unless the technician has the relevant experience and/or qualifications. Faults (and any subsequent repairs) should be reported in writing to the relevant line manager.

If technicians can demonstrate that they have carried out the testing procedure required by their employer in accordance with training, they are not responsible for any future faults that may occur.

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[4] DfEE (revised 1999) *Science accommodation in secondary schools, a Design Guide*, Building bulletin 80, Paragraph 3.2. Stationery Office. ISBN 0 11271039 5.

[5] CLEAPSS *Laboratory Handbook*, 2009, section 8.2.

[6] CLEAPSS *Guide G9 – Fume Cupboards in Schools*, 2014.

Any person subsequently using specialist equipment should visually check that it is working satisfactorily before using it, e.g. that the fume cupboard does indeed work before making chlorine.

Testing of portable electrical appliances, fume cupboards and pressure vessels is mandatory. The examination of portable electrical appliances, fume cupboards and some pressure vessels can be carried out by a trained technician, if the employer considers him/her to be competent. Examples of other routine inspections which are generally required of technicians are detailed in Table 3.

Table 3 Examples of visual inspection of equipment to be carried out by technicians

Tests	Frequency	Comments
Apparatus containing mercury	Yearly	Carefully inspect any flexible tubing for signs of cracking and proper fit. Apparatus should stand in trays.
Bunsen burner tubing	Yearly	Look for damaged surfaces, pinholes or loose butt-ends.
Gas cylinder regulators	Yearly	Look for damage.
Gas cylinders	Before use	Check valves to ensure that they turn readily.
Gas taps and fittings	Termly	The fittings should be firmly fixed. The taps should turn easily and not leak. Faults and leaks require a specialist to repair them but the technician may remove temporary blockages if this does not cause damage.
Lifting beams, rings and hoists	Before use	Look for signs of corroding metal, cracked plaster or frayed ropes.
Equipment not used for some years	When required	Examine carefully before use (e.g. frayed rubber connections).
Hand tools	Termly	Examine carefully before use. Each term, check for loose, broken or missing handles, dull or damaged blades.
Power tools and machinery	Termly	Inspect for firmness of mounting and correct operation of switches. Check any power cables are in good condition.

3.7 Maintenance of resources

Part of the technician's job is to maintain the resources of the department. Technicians may have a delegated role to ensure that equipment and chemicals are stored securely and to carry out regular checks of certain items that have been identified as being either of particular value or hazardous. For example, in 2011 the Home office initiative Secure Your Chemicals (SYC Code (Education)) identified chemicals that are of most concern in this regard. For details see CLEAPSS and SSERC websites.

In addition technicians will often carry out simple maintenance of the laboratory. Health and safety considerations are outlined in Table 4.

Table 4 Maintenance of materials, livestock and equipment

Animals	The treatment of livestock kept by the school should be discussed with the senior biologist. Looking after animals during holidays is a particular problem. Signs of sensitivity or allergies developing in a technician should be reported to the senior biologist. Hygiene is very important.
Blocked gas taps	Gas taps may be unblocked as long as it is impossible to damage the installation. See CLEAPSS *Laboratory Handbook*, section 8.1.2 for a suitable tool for carrying out this procedure.

Budgeting	Priority should be given to the safety and suitability of the equipment. For example, soda-glass tubing is inexpensive but does not withstand heat stress or careless use. It can break and give rise to cuts; borosilicate tubing is more expensive but safer to use. Advice on the safety of suitable equipment can be obtained from organisations such as CLEAPSS and SSERC.
Chemical stocktaking	Some chemicals pose storage hazards. For example, bottles, such as those containing '880' ammonia and 100 'vol' hydrogen peroxide solution can become pressurised. For safety reasons, these should be checked whilst stocktaking. Stocktaking is best carried out when the technician is unlikely to be disturbed as omissions can easily be made when there are constant interruptions.
Equipment stocktaking	This is normally carried out once a year and is best tackled when there is likely to be the least interruption. Non-electrical equipment should be visually checked to see if it appears safe and, if not, replaced or repaired. For example, rubber tubing connected to glass tubing may be weakening due to attack by corrosive gases or uv light; if not replaced, rubber tubing may leak when being used.
Mains electrical equipment	Only a technician who has experience or received relevant training and deemed competent by the employer should maintain such equipment. Advice can be obtained from organisations such as CLEAPSS and SSERC.
Microbial cultures	The subculturing of microbial cultures should be carried out at regular intervals to maintain viability.
Plants	The variety of plants ordered and their care should be discussed with the senior biologist. Signs of sensitivity or allergies developing should be reported to the senior biologist. Hygiene is very important.
Sinks and sink traps	These may contain sharp objects, unpleasant materials and strong odours. Water should be flushed through before starting. Suitable gloves, eye protection (and old clothing) should be worn and the room should be well ventilated.