

Module 7 Workshop Organisation and Management

Unit 7.1 Organisation of Tech/Voc Workshops/Laboratories

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Rationale

One of the distinct differences between teaching purely academic subjects and those in the technical or vocational fields is the element of practical work which requires access to workshops or laboratories, equipment, and consumables.

As some of the materials are hazardous, the management required is different from that of a general classroom. The presence of items that have the potential to be a safety hazard, the need for a higher concern for public safety, the appropriate storage of poisonous or hazardous materials, and ensuring compliance with safe working practises, all add to a need for appropriate organisation and management.

However, this module will alert you to many of the responsibilities and considerations that you must be aware of as a teacher in a practical field. It will also equip you with some tools to help you accommodate this aspect of your work with a higher level of confidence. Most countries today have a much greater awareness, sense of responsibility and accountability toward public safety, and as a teacher, you have a particular role to play in instilling this responsibility in your students. The most effective method of achieving this is by your own example and the example you set in the management of your workshop or laboratory. Apart from the safety aspect, a well organised and managed workshop will provide an environment that is conducive to an efficient and effective work ethic.

About this unit

Welcome to Unit 7.1, the first of two under Module 7, which looks at the organisation, and management of technical & vocational workshops/laboratories.

The unit consists of five sections.

Section 1: Outlines some practical suggestions in the planning of a workshop.

Section 2: Analyses systems of instruction.

Section 3: Investigates the use of learning resources and the impact on planning a workshop.

Section 4: Identifies workspace requirements, location of workshop equipment and storage considerations.

Section 5: Discusses environmental factors, which influence workshop planning.

How to use this book

In addition to the information on workshop organisation, the unit includes activities and exercises, and an assignment to be completed and submitted to your tutor.

The activities and exercises will not be considered as part of your assessment for the unit. Their purpose is to assist you to check your progress as you proceed through the unit.

How you'll be assessed

You will be assessed on your response to the assignments at the end of this unit.

The assignments will require some research on your part and will be presented in words and diagrams. Please contact your tutor regarding the time allowed for its completion.

Finding your way

As you work through the text you'll see symbols in the left margin of some pages. These “icons” guide you through the content.



Read



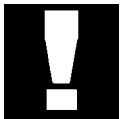
Important- take note!



Self-checking question/activity



Assessment task



Competency

In some countries, the resources of Technical and Vocational Education and Training curricula are competency based. The competency for each unit is expressed as a number of learning outcomes and assessment criteria.

Assessment criteria specify what you must be able to do to show you have gained the knowledge and skills needed to achieve each learning outcome.

Each unit has its own assessment criteria specified. Recognition of prior learning is encouraged. If you feel confident you have the necessary level of competence to successfully complete the elements shown under Assessment Criteria on the next page you may be able to take the assessment without studying the unit.

Learning outcomes

When you have completed this unit you should be able to:

- Identify characteristics of a well-organised Tech/Voc training workshop.
- Identify the educational/industrial factors to be considered when planning and organising a Tech/Voc training workshop.

- State workspace requirements, including location of equipment, for a given training outcome.
- Determine the storage requirements for training workshops/laboratories.
- Identify environmental and safety factors to be considered in the planning of Tech/Voc training workshops.
- Evaluate sample training workshops for their strengths and weaknesses, given the training outcome to be achieved.
- Identify management techniques that will assist in promoting effective workshop practise.

Assessment criteria

The assessment criteria for this unit requires you to:

- Identify, in accordance with the provided information:
 - the characteristics of well organised tech/voc training workshops.
 - the educational factors to be considered when planning and organising tech/voc training workshops.
 - environmental and safety factors to be considered in the planning of tech/voc workshops.
 - management techniques that assist in promoting effective workshop practises.
- Explain workspace requirements in workshops, including legal implications and regulations, and highlighting the required ratio of students for the area.
- State, in accordance with provided information, the storage requirements for training workshops/laboratories.
- Detect safety hazards and efficiency of operation of workshops shown in sample workshops.
- Plan, giving regard to elements in the previous assessment criterion and including location of equipment, a workshop for a given training outcome.
- Evaluate, given the training outcome to be achieved, the strengths and weaknesses of given sample workshops.

Section 1



Characteristics of well-organised workshops

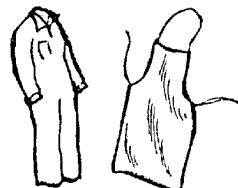
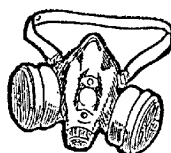
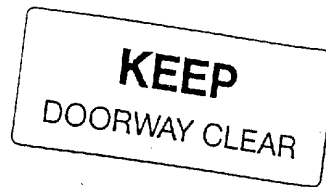
What are some of the important characteristics of a well-organised training workshop? If you walked into a workshop, what indicators would tell you that it was well organised?

Here are some indicators that should be evident in a well planned and organised Tech/Voc training workshop.

- The workshop must be safe to work in, and in the event of an accident, there must be clear emergency procedures.
- In the case of injury or illness, people should know the procedures for the treatment of first aid. First aid treatment should follow currently accepted practises and where available, recognised standards of first aid practise should be referred to for guidance.
- Aisles of travel and safety zones designated by painted lines.
- There should be sufficient space for each person to perform the tasks required without restricting him/herself or others. There should be availability and access to all of the necessary tools, equipment and materials required to perform the tasks.
- The working area must be clean and maintained to ensure ease of access and clean output.
- Poisonous and flammable substances are labelled and stored correctly.
- Tools and other small equipment are stored correctly.
- Clear information is available regarding procedures covering access to the workshop and the security of equipment, materials and personal belongings.
- Appropriate fire extinguishers and hoses are evident and regularly checked and positioned to enable efficient access.
- Electrical leads and connections are labelled, in good condition and regularly checked for safe use.
- Rules and notices regarding smoking in the workshop vicinity are clear and precise.
- Adequate natural or electric lighting and ventilation available to ensure that the working environment is appropriate.
- Receptacles for waste and recycling strategically positioned.
- Safety rules and signs posted in hazardous areas.

The way your workshop is organised will depend on the specialist equipment and consumables of your field.







Activity 1

Can you add to the list on page 7?

In your industry or area of operation, are there special circumstances that must be considered in your approach to workshop planning?

Write your thoughts and discuss them with your tutor and others in your learning group (if possible).

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.



Safety Factors

It is important to develop and follow safe work practises at all times. A training workshop or laboratory must be a safe environment for all who use the facility.

Simple rules can be applied so that all trainees can work safely and confidently.

The following procedures assist in providing a safe working environment:

- regular checks of equipment are made to avoid injury to self and others
- personal protective clothing/equipment is stored according to recognised procedures
- safety signs/symbols are identified and followed as per instructions
- equipment, machinery and materials are used in accordance with agreed policy and procedures and are displayed on or near the machine
- first aid kits are stocked in consultation with appropriate authorities
- workshop housekeeping is undertaken according to recognised procedures
- mandatory protective clothing is worn, and safety precautions designed for protection when handling chemicals/harmful substances are followed at all times
- hazardous chemicals and solid wastes are disposed of safely in compliance with recognised laws and regulations
- chemicals/harmful substances are stored in accordance with recognised regulations
- perishable goods or foods are stored appropriately
- structural workshop hazards/unsafe working conditions are reported to the appropriate authority
- correct manual handling techniques are followed when carrying, lifting, pushing or pulling heavy objects



Basic First Aid Kit

- The contents of the kit should be a solid, sturdy dust-proof container which is large enough to adequately house the contents.
- It should be capable of being fixed to a wall or another location and it should not be locked.
- It is usually identified by a large cross.
- Contents of the kit should include:
 - basic first aid notes
 - individually wrapped sterile adhesive dressings
 - sterile eye pads
 - sterile coverings for serious wounds
 - triangular bandages
 - safety pins
 - sterile unmedicated wound dressings - small, medium, large
 - adhesive tape
 - rubber thread or crepe bandages
 - scissors
 - disposable gloves
 - eye baths



Storage Requirements

Flammable and poisonous materials should be labelled and kept in storage areas that are lockable and have adequate ventilation. The shelf life of the items must be indicated clearly.

Racks in each store should be fixed, and warning signs depicting dangers must be prominently displayed.

Dangerous materials must be stored in accordance with local regulations. We shall consider two categories of materials that require special storage arrangements.

Flammable materials are easily ignited by external sources, such as sparks or flames, and must be stored in an indoor fireproof cabinet or room. Appropriate, portable fire extinguishers must be provided.

Poisonous materials are substances that are liable to cause death or serious injury if swallowed, inhaled or come in contact with the skin. These materials must be kept in restricted areas that are at least three metres from other dangerous materials and away from sources of ignition or heat. Adequate fire extinguishers must be provided in or near the storage area.

In addition to storage for dangerous materials, adequate and appropriate storage space must be available for:

- materials/consumables
- tools and equipment
- waste materials

Depending on the size and type of workshop, storage facilities can vary from the very sophisticated and expensive to very basic. The main aspect of storage should be to allow easy storage and retrieval, ease of stock control (if applicable) and security.

Well-organised open shelving within the workshop area may be adequate for certain items, while secured storage may be necessary for others.

Security

Security is necessary for two main reasons:

- protection against personal risk
- prevention of loss

Protection against personal risk and liability is the more critical of the two, as those responsible for the safety of others could be held liable for negligence should accidents occur. Commitment to a well-organised workshop and attention to correct storage will lessen the risk of personal injury.

Prevention of loss is also essential as most teachers and instructors are in a position of being accountable for their workshop/laboratories and its equipment. Storage of equipment must be such that it eases this burden of responsibility by making control an efficient and not laborious task.

Access

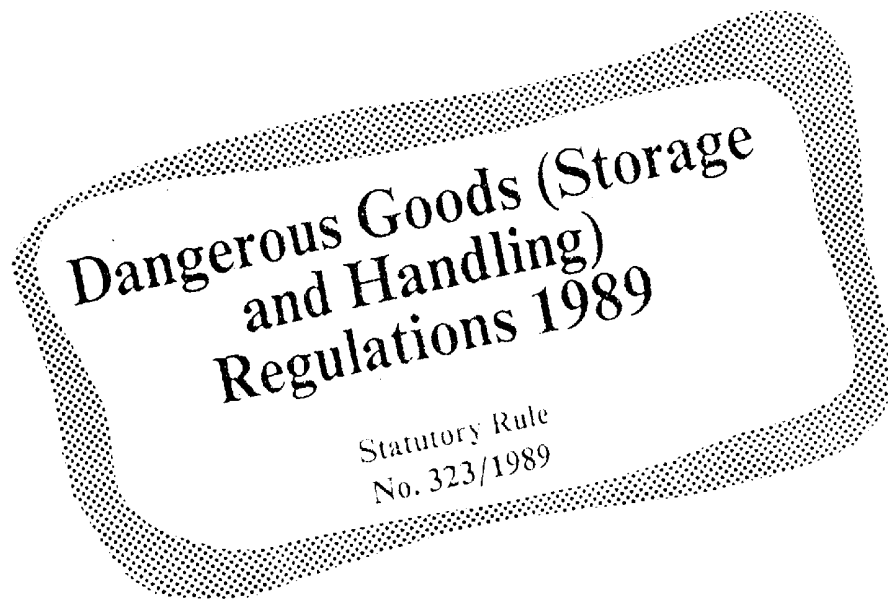
Control of access to a workshop/laboratory by students will depend on the area involved. A low personal risk and loss area may allow students to have totally free access without supervision. This is rarely the case, as most technical and vocational areas involve expensive machinery and tools, which often create the potential for personal risk.

In the planning and organisation of a workshop/laboratory, one of the issues that need to be considered is that of trainee or student access. If free access is anticipated, this will have significant implication on the type of storage that may then be necessary, from both aspects of security - personal risk and loss.

Cleanliness

The workshop environment should be maintained in a clean condition by:

- removing dirt, refuse and waste at least daily from any floor, benches and desks, and from any stairways and passageways
- cleaning windows and skylights so that natural light is not restricted
- cleaning change rooms at least once a day and washing down at least once a week when in use
- sanitising any showers and washing facilities each day they are used.



Activity 2

1. List some of the more dangerous materials used in your industry or area of operation and state the measures used to ensure their safe storage and handling.

2. How would you define:
 - (a) a flammable substance

- (b) a poisonous substance

(continued)

3. (a) Do you have knowledge of first aid procedures? (Y/N)

(b) What first aid training have you received?

(c) What specific type of injury is common to your occupational field?

(d) In what way is your current workshop/laboratory equipped to deal with first aid? or

What procedures need to be in place to allow you to deal with first aid?

(d) Where can first aid training be arranged in your location?

4 List any equipment or consumables in your area of operation that would need to be stored in a locked area or cupboard for protection against:

Personal Risk	Loss

Check your responses with your tutor.



Assignment No. 7.1-1

Unit 7.1 Organisation of Tech/Voc Workshops/Laboratories

You are now required to do Assignment 7.1 – 1 which will be found at the end of this unit or distributed by your tutor.

Section 2



Requirements for Systems of Instruction

There are many ways of delivering information. It has often been said that the best arrangement is one teacher and one student. In some educational centres it may be necessary for one teacher to be responsible for thirty or more students.

The system of instruction used will determine the type of design and organisation of the workshop.

If the system is **teacher-centred**, it is obvious that many in a class of thirty will not gain all of the knowledge expected from such a situation. If the class is smaller, say up to twenty students, there is a good chance that instruction will be considered adequate.

Teacher-centred instruction will normally take place in either a classroom, a workshop, or both. The classroom would be used for theory lessons, tutorials, group discussion and general activities. The room should contain a movable chair and desk for the teacher and movable chairs and desks for the students.

The room should be equipped with audio/visual equipment and a fixed chalkboard or whiteboard and projector screen.

It is suggested that the classroom should allow approximately 2.5 square metres of space per student.

In the workshop where teacher-centred training occurs, each student generally has their own “workspace”, whether this be a kitchen bench with sink and possible shared use of an oven and cook top, or a workbench in a mechanical or manufacturing type workshop with shared use of welding equipment or heavy machinery.

This type of workshop needs to have a suitable area for group demonstration.

Student-centred learning requires a different approach from teacher-based instruction. In this case the responsibility for achieving levels of competence is largely in the hands of the individual student.

Self-paced learning is a form of student-centred learning, as students progress through the course independently of their peers. The training area must be planned carefully for such an approach.

Training is designed so that students can work individually at their own pace to complete each task in sequential order in much the same way as would be expected on the job. This form of training integrates the theory or background knowledge and the practical skill to which the knowledge applies, which means the workshop must be organised to allow for this movement.

Learners must demonstrate proficiency by completing each set task to pre-determined standards before proceeding to the next stage.

Each student works to a program that is developed to suit his or her learning requirements.

Because of varying abilities and some pre-experience, a number of students will complete training in shorter than prescribed time frames; others will take longer.

Training areas for this purpose will have:

- an adequately-equipped workshop where the work tasks are performed
- a separate resource area where the student has access to learning materials in the form of written information, audio-visual programs, computer programs and demonstration, and explanatory discussions with subject teacher(s)

One of the first jobs is to look at the current facilities for teacher-centred learning and plan the changes needed for the facility to cope with students learning at their own rate. Previously the teacher was able to control the learning by having all the students doing the same topic at the same time.

In the student-centred learning environment the students may all be doing a range of topics at the same time; therefore, there is a need to reorganise the workshop and resource centre that allows the instructor to manage a whole range of learning activities.

In the cases where the resource centre is located in a separate building, there may be a need to incorporate it into the practical area so the student can do the relevant part of theory for the identified part of a skill. Otherwise, the student may have to move between areas/buildings to the resource centre to read up/do/re-do some part of the theory.

It is not an efficient process to have a student walking from one building to another.

Work benches and equipment may also need to be rearranged to ensure students are working in a more realistic, safe, industry type workshop environment where they can practise their skills to achieve the required standards. The storage of frequently used equipment must be given consideration when planning the workshop for a system of competency based training, which of course implies a system of self-paced learning.

A storage area for flammable materials is essential and must be flame and spill proof.

Painting of yellow lines to indicate where people can walk safely in the workshop is an important safety factor.

The use of portable tool boards can save space in the storage area and, being portable, they can be taken to the work site.

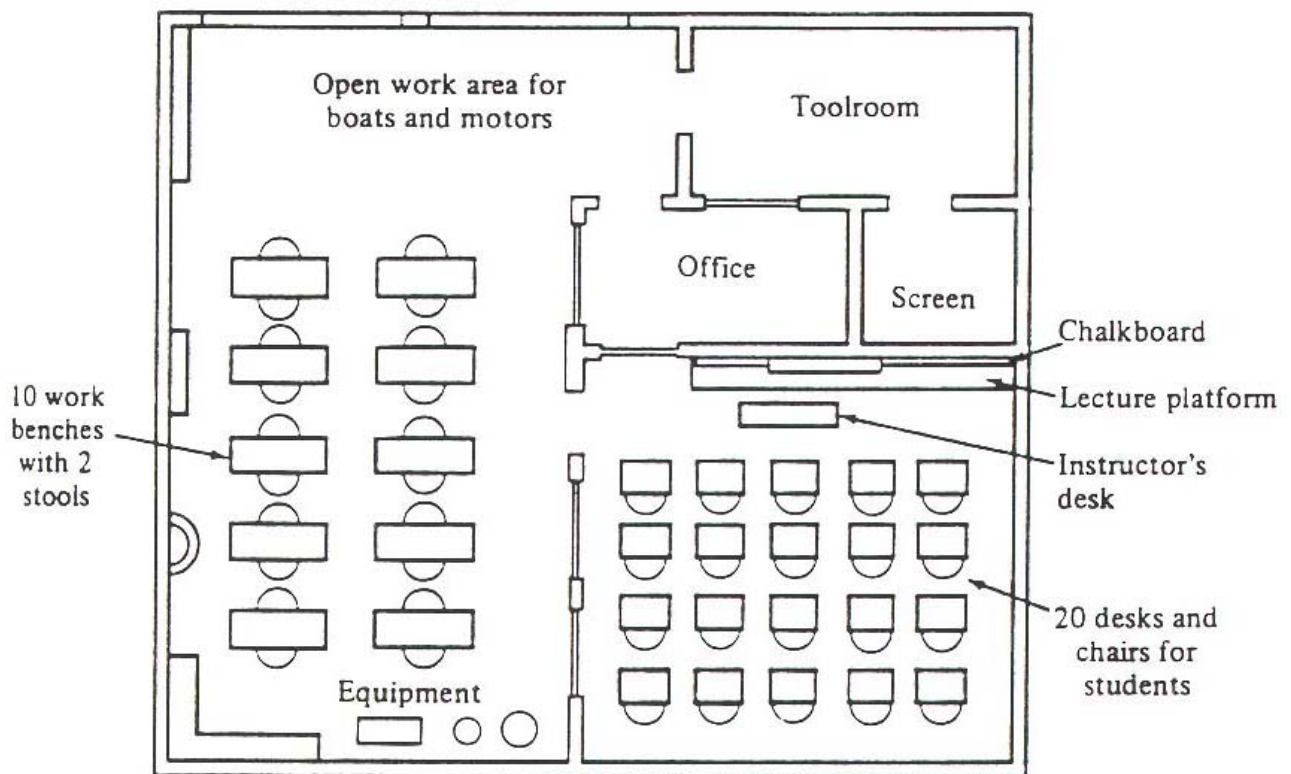
Displaying tools and equipment on tool racks and boards makes it easier to check for missing tools at the end of each session.

So, planning the workshop changes is one of the most important steps in a competency-based or self-paced learning environment.

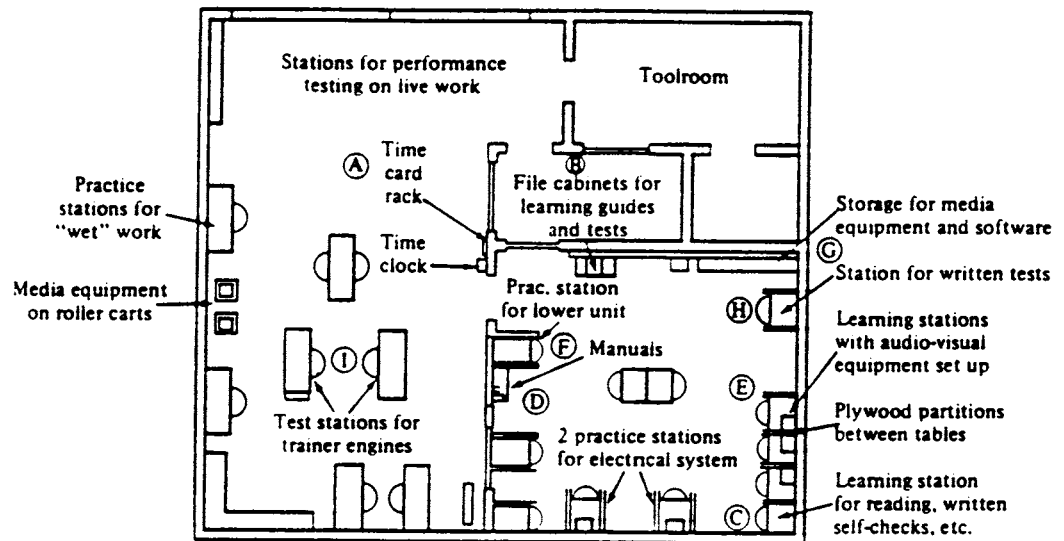
Diagram 1 shows a layout of a traditional classroom that is set up for the teacher-centred learning where the whole class is being given the same lesson/topic.

Diagram 2 shows the layout for a student-centred or competency-based/self-paced training facility.

Note that the shape and wall structures are the same for both workshops but the relocation of the equipment and resources in diagram 2 has changed dramatically, with very little or no cost for structural changes.



Layout of traditional classroom



Layout of CBT classroom



Planning the Facility – A System of Competency-Based Training

The teacher in charge will schedule the operations of the students so that a smooth workflow is maintained. That is, no unnecessary hold-ups caused by a number of students waiting to use the same machinery.

This form of instruction is more cost effective for the following reasons:

- less equipment is required as there is no need for class sets materials can be purchased for students on a needs basis and requires fewer to be kept in stores
- due to their previous experience and ability, some students will use fewer materials in some exercises

It is difficult to put a figure on the individual trainee's space requirements in such a flexible approach to training. Space will depend on the kind of workshop training required for a specific industry.

It is suggested that the following space be allowed for each trainee in these two examples:

Carpentry and Joinery - 14.6 square metres

Plumbing and Mechanical Services - 20.3 square metres

Competency-based instruction can be delivered in various ways, from the traditional teacher-centred approach to the non-traditional self-paced or student-centred delivery.

Industry is progressively developing new classifications and job structures, based on competencies identified in standards endorsed by national authorities.

Wherever training occurs, competency-based assessment processes may be required. This may include on or off-the-job assessment.

Modular training made up from self-contained units is preferred.

These can be combined in different ways to meet the specific needs of the learners involved.

The curriculum for competency-based training should be prepared and delivered so as to:

- assess and give credit for competencies held as a result of prior learning (RPL – Recognition of Prior Learning)
- be available in modular form
- provide for articulated training pathways
- link and integrate the content and competencies of the separate components of the training as much as possible, for example, through project work
- develop recognised key competencies including cognitive skills, for example, problem solving
- provide a variety of learning strategies, and free access to them, to motivate learners and to cater for individual differences
- emphasise the process of learning as well as vocational education and training outcomes
- be available to learners in a flexible form including a range of locations, times and modes of delivery
- provide appropriate reports and feedback to learners on competencies acquired
- ensure that assessments are recorded accurately and that they are accessible
- enable the most effective and efficient achievement of competencies
- provide for a review to evaluate the appropriateness of curriculum

The workshop must be designed to allow these characteristics of CBT to be accommodated.



Summary

- Teacher-centred learning is normally conducted in a classroom by a teacher who is responsible for the delivery of information to a group of learners.
- Student-centred learning is driven by the student who is in control of his/her own learning. Also called self-paced or individualised learning. It allows the student free movement between the resource units and the practical area.
- Competency-based instruction requires training programs that reflect standards of performance required by industry – competency standards.
- The system of instruction employed will have significant impact on the design and organisation of the workshop/laboratory.

Section 3



Implications of using Learning Resources

General

The type and quantity of learning resources that are used in a workshop or laboratory will also impact on the way the facility will need to be organised.

For example, a traditional classroom of the past, used for teaching theory classes, would possibly have had little more equipment than the student desks or tables, a blackboard, and a few cupboards for storing papers and books. Add to this some display boards and it is probably the type of classroom you may be familiar with from your earlier education.

Today, we have sophisticated hardware and a variety of learning materials, based on technologies, to aid instruction.

The placement and storage of the equipment and the learning materials, creates a different set of issues that need to be addressed in organising a workshop or learning facility.

The teaching/learning strategy being practised will also impact on the organisation of the workshop. A teacher-centred or traditional system of training will not involve the issue of “student access” to the same degree as a system based on student-centred learning.

You therefore need to think about the following issues in relation to the type of teaching strategy you employ, and the impact of the field you operate in.

Resources

A list of the learning resources that might need to be accommodated in a learning facility to train people for employment in the industry sector might include:

- text books
- workshop manuals and technical information
- product information
- instructor developed learning materials
- videos

- Compact Discs (CD) and audio tapes
- product samples
- slides
- slide / tape presentations
- models

Equipment

The equipment required to utilise these recourses would include:

- television set
- video cassette recorder/player - VCR
- combination VCR and screen
- audio cassette player
- slide projector
- slide/audio synchronised player
- OHP
- computer/printer

This variety of equipment and resources will require specific storage and consideration of student access when organising the workshop or training facility.

Placement and storage

Once either electrical or electronic equipment is introduced into the training facility, special consideration needs to be given to the conditions for its efficient and effective operation.

The earlier technologies such as basic slide projectors and audiocassette recorders are not as sensitive to the environmental factors of dust and heat. However computers and VCRs are, and being much more costly items, require special consideration as to their placement to allow for their protection as well as student accessibility.

In the heavier of the industry training fields, it has been unusual for instruction to be available to students on video and computers. This is no longer the case, and increasingly, students are gaining their theoretical instruction from videos and simulated experience from computers. To care for such sensitive and expensive equipment, a carefully managed schedule must be implemented, but at the same time allow student access?

Paper-based resources

- Bookshelves and filing cabinets are probably the most effective ways of storing paper-based learning resources.
- Hard cover or substantial publications can be accommodated on open shelving if there is not a dust problem. Glass-door book cabinets may be required if dust is a significant issue.
- Loose leaf or slim type consumable learning materials like Student Worksheets or student workbooks are best stored in filing cabinets.

Videos and tapes

- Videos and audiotapes should never be stored in metal cabinets. The magnetic characteristics of these products make metal containers unsuitable.
- Store in glass-door, wooden cabinets which allow easy identification of the content without the necessity of opening the door.
- Wooden cabinets can be fitted with locks, which also assist in overcoming any problems of security.

Slides and slide/tape presentations

- If students are to use slides, they should be housed in the containers that apply to the playing equipment. For example, slides to be used with a Kodak Carousel should be kept in the carousel, ready to put on the machine. If used on a slide projector, then in the appropriate trays.
- Trays and carousels can be kept in glass-door cupboard the same or similar to that used for videos and tapes.
- It is a viable alternative to transfer slides (and the related narration) to video, as the replay equipment is now less expensive than synchronised slide/tape machines.
- Slides transferred to video also overcome the problem of missing slides, or a tray or carousel of slides being dropped, with the resulting problem of sorting and replacing them in the container.

Computer discs

Closed and lockable computer disc storage boxes are the most appropriate way to store these.

- The access students are allowed to these will determine where they are housed in the learning facility.
- Where students are using the computer individually to access learning programmes, it is more efficient to have the programmes loaded on the hard drive and networked to a number of stations.

Lockable Room

The ideal situation for a training facility that requires hands on practical work with machinery, equipment, and instruction provided in some part electronically, could be a lockable, learning resources centre alongside or close to the actual workshop or laboratory. This layout would provide:

- storage space for all learning resources
- study desks or corrals for students
- access to computers and replay equipment
- access to all learning resources
- security and control of equipment and resources

In “clean” trade areas (i.e. garment construction, beauty culture, office practise) this may not be necessary, and these elements could be incorporated into the actual practical working area.



Summary

The issues you will need to consider relating to the use of learning resources when you plan and organise your workshop area are:

- what are the implications of your field of operation in terms of the environment it creates - dusty, wet etc.
- what type of learning/teaching strategy do you wish to use
- what type of learning resources do you anticipate will be available
- what equipment is necessary to effectively utilise the resources
- what type of storage, usage space will the equipment require
- what access will students need to have to the resources and equipment.



Activity 3

Your supervisor has asked you to organise your training facility to better accommodate the needs of the students and instructors. Create a list under the following headings that will allow you to think through the implications.

- My field of operation / trade area is:
- What are the environmental impacts of this field of operation/trade area (dirty, dusty, wet, clean, hygiene, heat.)?
- My teaching/learning strategy will be:
- The type of learning resources I want to use include:
- The equipment required for this would be:
- My preferred placement/ storage for equipment and learning resources would be:
- Student access would require:

If it is feasible, check your response with a colleague or your supervisor in your own field before discussing it with your tutor.

Section 4



Workshop considerations

Workspace Requirements

If work is to be performed in a safe manner, sufficient space should be allocated. Movement in and around workstations should be unhindered by workshop equipment, materials or other trainees.

Workshop design and layout should enable workstations to be accommodated in the safest and most efficient configuration. Workstations should provide clear space for trainees. The clear space should be exclusive of desks, benches, machinery and any other fittings.

Local regulations will apply to actual space allowable. Work processes and the ergonomics of materials, or the manual handling tasks may require that clear space be increased.

Where work tasks are largely conducted on workbenches, consideration must be given to allow adequate space for their efficient use. Environmental problems such as heat or noise may also require increases to the recommended size. Aisles, passageways and access to cupboards or doors should be in addition to the calculated clear workstation space.

Location of Equipment

The following rules apply to the safe and efficient location of fixed workshop machinery:

1. Adequate distance exists between machinery, and safety switches operate effectively on all machinery.
2. Safety barriers are correctly placed and machine guards are in proper working order on all machinery.
3. Rotating machinery is properly guarded and machinery stop buttons are adequate and in proper working order.
4. Fume and dust extraction facilities are adequate and in proper working order for the size of the workshop.
5. Adequate lighting is provided in booths or compartments where work is performed.

Fixed machinery and portable or hand-held power tools must be operated in accordance with established workshop policy procedures and machinery manufacturer's recommendations. Any faults identified in operation must be reported to the appropriate authority.

Arrangements may be made with suppliers and/or machinery manufacturers to place items of machinery or equipment in the training workshop for demonstration purposes. *This is often a good opportunity to gain experience with new, currently-used industrial equipment. Depending on the arrangement, the placement may be on a permanent basis, but most likely a temporary one.*

Clear instructions for the use of demonstration equipment must be established, for instance, is it just for demonstration, or can trainees, under supervision, have "hands-on" experience? Signed letters of agreement are essential to protect the rights of all concerned.

Workshop Layout

On page 33 are samples floor plans of two workshops.

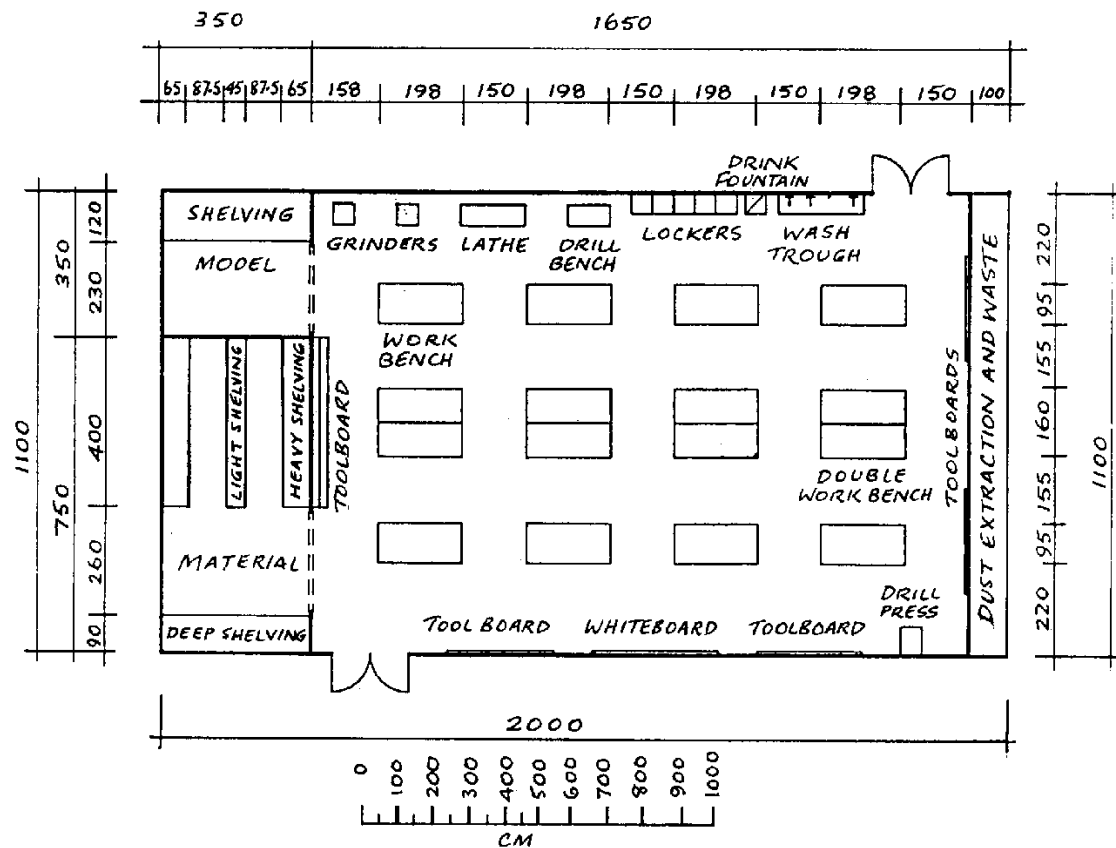
Layout 1 is a general workshop area with workbenches for teaching trade practises to a maximum of 15 trainees.

The workshop includes dust extraction, a waste zone, and stores for materials and models/projects. Space allocation for each trainee is 146 square metres.

Layout 2 is a workshop area with workbenches for teaching trade practises in the use of power tools to a maximum of 15 trainees.

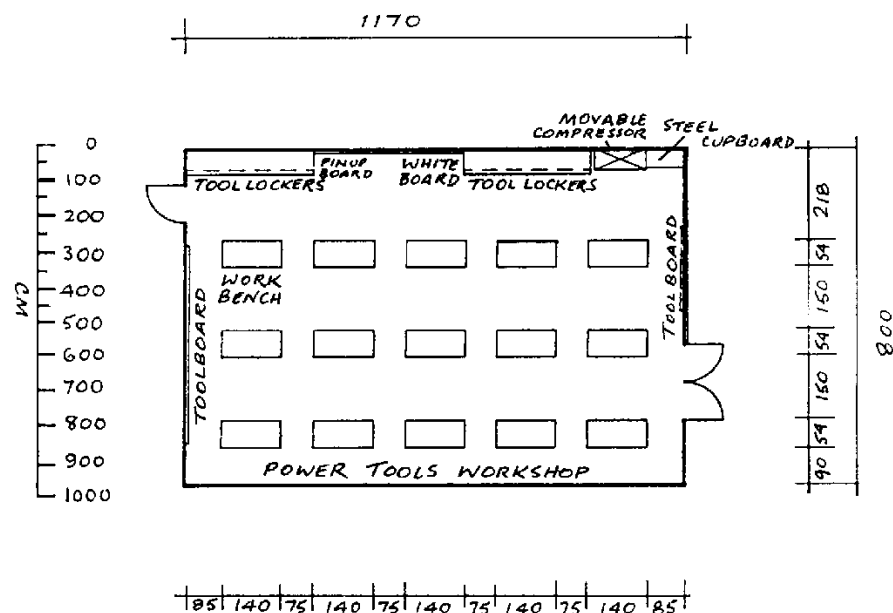
Space allocation for each trainee is 6.3 square metres.

Please note: all measurements are metric.



LAYOUT 1 GENERAL WORKSHOP FOR 15 STUDENTS

LAYOUT 2 POWER TOOLS WORKSHOP FOR 15 STUDENTS



You will have noted that estimated space allocations have been made for trainees in the illustrated workshop examples. Based on similar principles, here are space requirements calculated for trainees in the following industry workshops:

Automotive:

Panel Beating: Fabrication Workshop:	15.0 square metres
Vehicle Painting: Spray Booth:	8.2 square metres
Motor Mechanics: General Stream:	12.8 square metres.

Electrical:

Industrial Practise:	14.4 square metres.
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Engineering: Mechanical Manufacturing:

Maintenance Skills:	15.0 square metres
Fitting and machining:	14.8 square metres

Painting and Decorating:

Painting and Paper Hanging:	14.4 square metres
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Bricklaying:

Multi-skill Workshop:	11.0 square metres
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Plumbing:

Basic Skills Workshop:	8.8 square metres
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Tourism and Hospitality:

Front Office/Reception Area:	3.1 square metres
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Personal Services: Hairdressing:

Wet Practise Area:	6.6 square metres
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It must be noted that these figures relate to basic workshop areas only. These estimates do not include space required for other branches of the named industries, or for the wide range of storage requirements.

Factors to consider in laying out a shop

- Floor plan of the building or shop (available space)
- Amount and source of light (natural and artificial)
- Ventilation
- Electrical outlet and power supply
- Machine placement (space allowed and accessibility)
- Production work organisation sequence
- Wash rack and restroom facilities
- Shop departments (space for each)
- Location of chalkboard, bulletin boards
- Instructor's desk, filing cabinets
- Assembly space
- Location of classroom within shop
- Demonstration bench and facilities
- Arrangement of reference material
- Time keeping facilities
- Locker facilities
- Storage room and facilities (arrangement and location)
- Scrap bins
- Lanes of travel
- Pillars
- Partitions
- Future expansion
- Shop hazards
- Student capacity required
- First aid supplies
- Project storage, lockers



Activity 4

You are designing a workshop or training kitchen. After careful consideration it is decided to allow 12 square metres for each trainee, and the workshop is to cater for 12 trainees.

How big is the workshop?

If you say 144 square metres you are correct.

Now calculate the size of the workshops listed on page 42, assuming that there will be a maximum number of 12 trainees in each workshop.

For Example:

A Panel Beating workshop for 12 trainees would require:

12 trainees x 15 square metres

= 12 x 15 m²

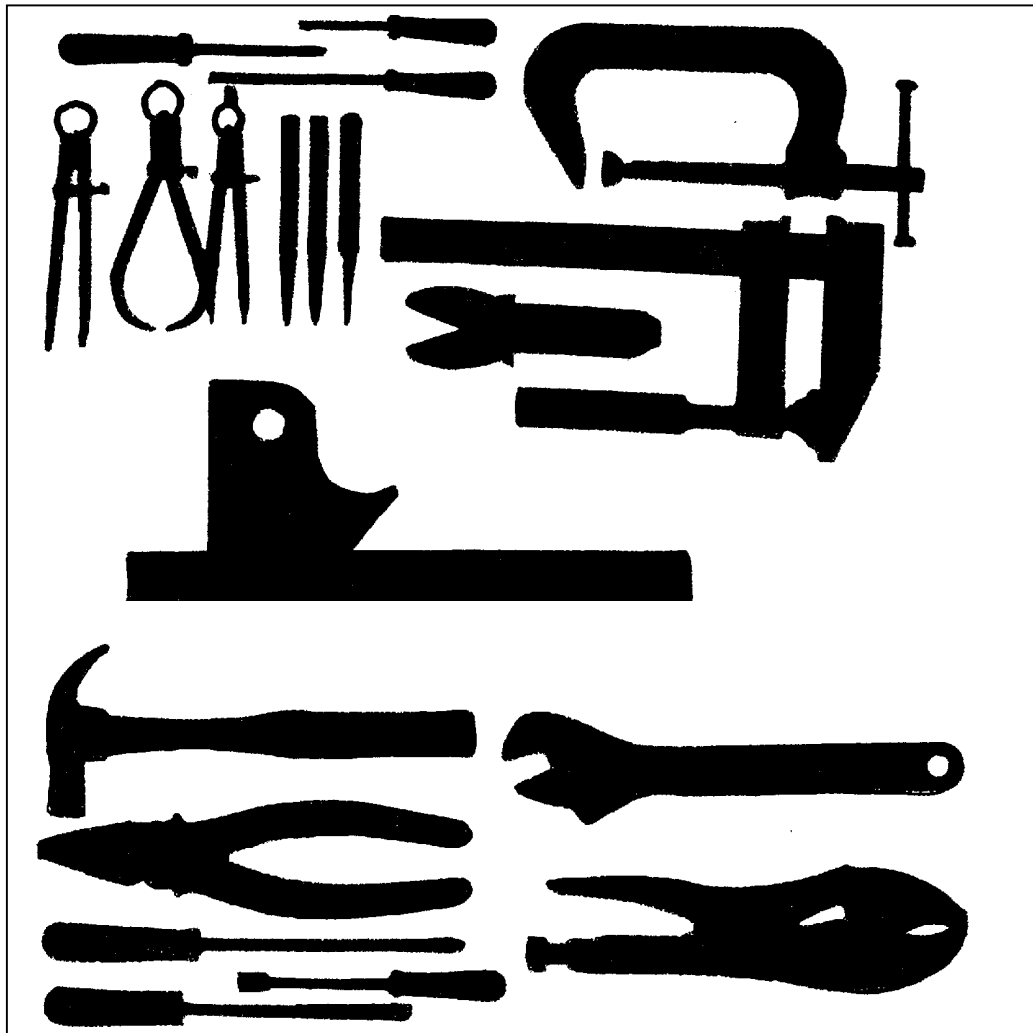
=180 square metres



Storage Considerations

Storage considerations must take into account the placement of workshop items so that they are easily and accurately identified. For example, a system that has been used for many years in industry and in home workshops is the shadow board.

This is a fixed board situated along the wall of the workshop on which the shapes of individual hand tools are clearly shown. Hooks or pegs enable the tools to be hung so that they fit their “shadows”.



The shadow board enables you to do a quick check on which tools are in use and whether all tools in the kit have been returned at the end of training.

When heavy items of equipment or collections of tools must be transported to and from the storage and work area, it would be practical and sensible to use mechanical aids, such as trolleys or tool carts. Such assistance can lessen problems that can occur in the event of incorrect manual handling techniques.

When planning the workshop/laboratory, provision needs to be made for the storage of the above items of equipment (tool boards, equipment trolleys, ladders, stools, etc).

A secure, permanent, clearly marked storage place for each item allows for easy checking of missing equipment at the end of each session as well as allowing for smooth running of the workshop throughout the learning activity time.

A well-organised storage facility may require the appointment of a stores manager to supervise the identification, selection and return of tools, equipment and materials. The manager's task would also include continuing maintenance of the stores in the form of repairs and replacement.

However, in small departments or training centres it is not likely that this situation will be the norm. It will therefore be the responsibility of the individual instructor or teacher to monitor these issues. A well-organised workshop/laboratory would have a system in place that allows the teacher to ensure that equipment is maintained/replaced.

A stores area will normally be equipped with racks so that space can be efficiently utilised. Storage racks must be structurally sound and designed for the maximum load to which they will be subjected.

Racks on which dangerous materials are placed must be constructed using compatible materials.

If the workshop storage section is situated on a mezzanine floor, that is, a half-storey placed between the ground floor of the building and the second storey, the following considerations should be observed:

- security arrangements are maintained
- access and egress routes are kept clear
- alternative adequate procedures are available for the movement of heavy items, other than up and down stairways
- safe procedures are followed for the movement of dangerous materials



Activity 5

In the first column, list the kinds of tools, machinery, equipment and materials used in your industry. In the second column, list the preferred storage method.

Tools, machinery, equipment and materials	Preferred storage method

Again – Check this with a colleague or your supervisor.

Section 5



Workshop Environmental Factors

Most manufacturing enterprises have long since recognised the relationship between productivity and employee well being. Supervisors or managers are becoming increasingly aware of the need of the comfort of the trainees to assist them derive the greatest benefit from their training experience.

Temperature, ventilation and lighting are three elements of the environment that can be controlled by artificial means, but if this capacity does not exist, then steps need to be taken to ensure the comfort (and hence, motivation) of the student, using whatever natural means exist.

Temperature

In an ideal situation, the workshop environment would be maintained within a temperature range to protect trainees from thermal stress.

Ventilation and mechanical cooling systems should be arranged to counteract excessive heat.

On the other hand, workshops located in non-tropical areas should be capable of being heated during cold weather.

A temperature of at least 15 degrees Celsius is recommended where manual work is performed.

If a capacity does not exist to control the temperature and ventilation by air conditioning or heating, then the following steps should be employed:

- ensure enough windows and doors are fitted to take advantage of any cooler, outside air;
- insulate ceilings/roof where appropriate;
- use external awnings to protect window;

Lighting

Lighting where people work should be sufficient to allow the work to be performed safely and without eyestrain. Individual or task lights improve the intensity of light in areas where natural or general artificial lighting is insufficient.

Almost all jobs require us to use our eyes.

Good lighting means:

- being able to see what needs to be seen
- doing this without affecting health and safety

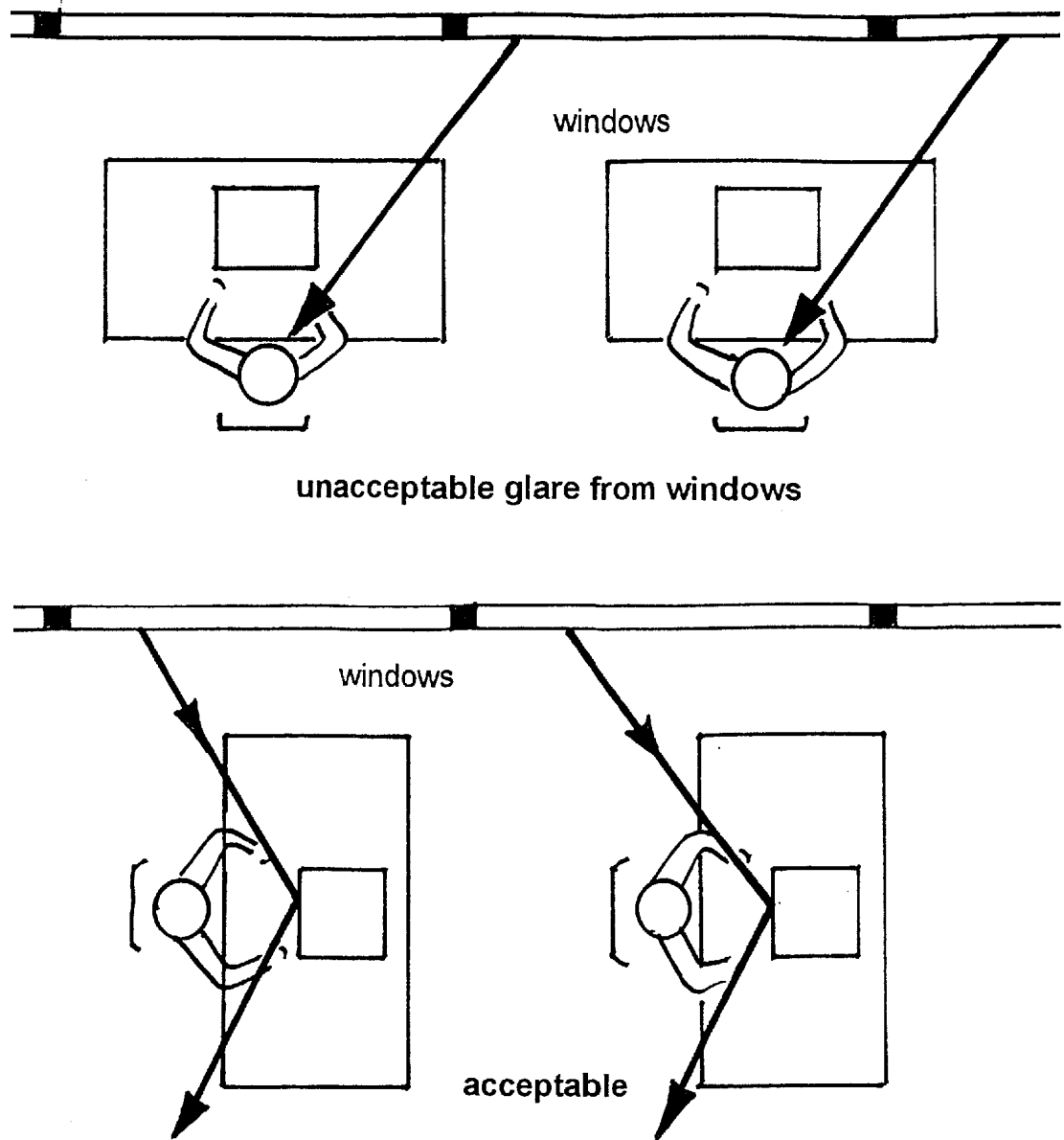
When planning a workshop factors that contribute to good lighting must be considered.

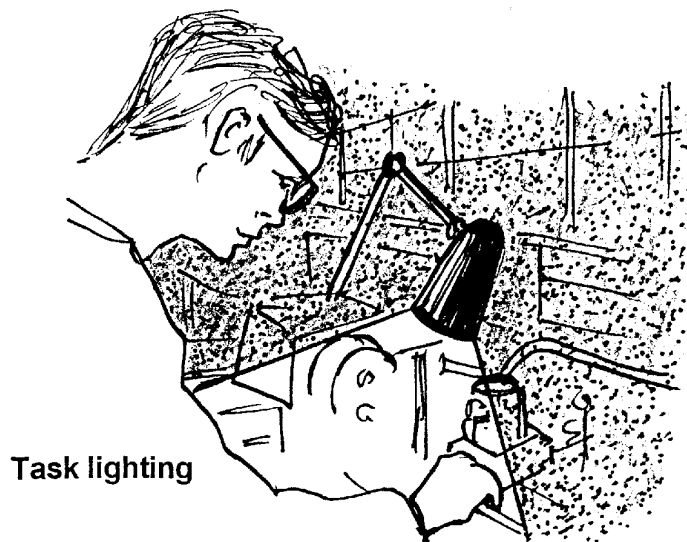
There are three main steps:

1. Design the workshop to avoid lighting problems.
 - Make maximum use of natural light by adhering to the following accepted principles:
 - Overhead windows are preferable to wall windows.
 - The vertical dimension of outside wall windows should be such that the top or head is within 15 centimetres from the ceiling and the bottom or sill at or above eye level.
 - Glass area should equal 30 percent of the floor area and should never be less than 16 percent.
 - Where there is only one window wall, room widths should be no more than two times the height of the windows.
 - Skylights and other kinds of overhead windows may require the installation of tinted, refracting, or diffusing glass in order to obtain proper distribution of light.
 - Windows should be shielded in order to meet changing daylight conditions.
 - Plan specific lighting installations to achieve required illumination levels to control glare and shadows, and to satisfy health and safety requirements.
2. Identify and assess lighting problems and difficulties in the workshop.
 - Assess factors such as the kind of lighting, the work being done and the overall workshop environment.
 - Assess lighting levels required and minimise glare, reflections and shadows.

3. Identify solutions to lighting problems.

- Investigate control measures to lighting problems.
- Alter the lighting system by:
 - lowering or raising the lights
 - changing the position of the lights
 - increasing or decreasing the number of lights





Disposal of toxic waste

- It is essential, for personal and general safety reasons, to positively identify any toxic materials that must be disposed of.
- Identification enables the use of the correct procedure for disposal. Procedures for disposal of waste have implications for the design and organisation of the workshop.
- Specific recommendations for disposal should be available and must be followed for environmental reasons.
- Do not dispose of toxic liquids into sewerage systems.
- Local laws must be checked for any special precautions for disposal of solid waste containers and closures in a landfill.
- Local authorities should be contacted to determine their provision for collection of wastes and location of depots.
- If incineration is recommended, conditions must be observed, particularly where there is possibility of emission of hazardous fumes or smoke.
- Safe transport of toxic substances must meet local regulatory requirements.
- Recommendations for neutralising spills must be observed.
- Procedures should include:
 - steps to be taken to minimise spills or leaks
 - methods for cleaning up spills and leaks
 - precautions to be observed by clean-up personnel:
 - removal of any ignition sources
 - protective clothing and equipment
 - any special equipment required for the clean-up

- Chemical manufacturers normally provide information about their products that include factors such as biodegradability or persistence in soil and water.

Can any waste products from the workshop be recycled? That is, can waste be made productive?

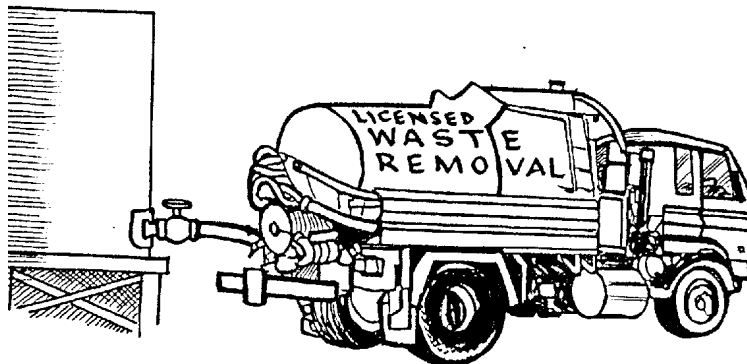
Many waste materials are regularly collected, treated and processed to be used repeatedly. Such actions are followed worldwide.

Recycling of paper products is a good example: you may be using a recycled paper product at this moment.

Examples of materials that can be recycled include:

- glass
- plastic
- metal
- paper - newsprint
- other paper and cardboard
- batteries

Any workshop waste materials that can be recycled in accordance with local provisions can be stored in suitable receptacles, bins or flexible containers ready for collection.





Activity 6

1. List the products that you will encounter in your trade or area of operation that need special consideration for disposal of waste.

2. List any products you use in your area that could be recycled.

3. Does provision exist within your workshop to accommodate item 1 and 2.

4. How can you impact on this situation?

Accessibility/pedestrian traffic flow.

Aisles and passageways in the workshop must be planned so that pedestrian traffic does not interfere with people at work, in the interest of safety and the subsequent quality of the work. Good planning will enable adequate access to tools, equipment and materials in storage areas. The space in which trainees will move and work within the workshop will depend upon local regulations. Trainees must be enabled to work safely between machines, benches or tables. Adequate space arrangements will also allow efficient evacuation in the case of emergency.



Assignment No. 7.1-2

Unit 7.1 Organisation of Tech/Voc Workshops/Laboratories

You are now required to do Assignment 7.1 – 2 which will be found at the end of this unit or distributed by our tutor.

Assessment Instrument

Module 7 Workshop Organisation and Management

Unit 7.1 Organisation of Tech/Voc Workshops/Laboratories

Assignment 1

The trainee has presented an assignment which:

- ☐ Listed five characteristics of a well organised workshop
- ☐ Listed five aspects of their particular subject areas which requires special consideration in planning a workshop/ laboratory or practise area
- ☐ Listed special storage requirements of their subject area
- ☐ Written comments of approximately 200 words that outline the safety issues of their particular subject area that included procedures relating to emergencies, the impact of the design and identification of specialised first aid requirements.



Assignment No. 7.1-1

Unit 7.1 Organisation of Tech/Voc Workshops/Laboratories

To be completed and returned to your Tutor for assessment.

This is an Open Book assignment and you may refer to whatever resources you have at your disposal.

Name: _____ Due Date: _____

Question 1

List five general characteristics of a well-organised workshop.

Question 2

In considering your own area of subject specialisation, list five aspects of the discipline that would require special consideration in the planning of a workshop/laboratory or practical area. Please specify what your subject specialisation is.

Question 3

List any special storage requirements pertinent to your subject specialisation and state what they are for (such as refrigerators or cool rooms for perishable food; secure, ventilated cupboards for flammable materials).

Question 4

Write a statement of approximately 200 words that outlines the safety issues involved in your subject specialisation. In your answer, include:

- identification of the safety issues
- procedures necessary to accommodate emergencies relating to these issues
- the impact of this on the design of the workshop/laboratory or practical area
- any specialist items which should be included in the first aid kit, above those generally found in a well equipped kit.

Assessment Instrument

Module 7 Workshop Organisation and Management

Unit 7.1 Organisation of Tech/Voc Workshops/Laboratories

Assignment 2

The trainee has successfully presented a written assignment that included:

- ☐ Selecting a known industry
- ☐ Drafting a floor plan, drawn to scale, of a technical/vocational workshop suitable for the selected industry.
- ☐ Writing comments totalling at least 500 words on the incorporation of the following factors into the organisational planning of the workshop:
 - ☐ workspace considerations
 - ☐ equipment placement
 - ☐ environmental considerations
 - ☐ safety
 - ☐ suitability for competence-based, student-centred training or teacher centred training, dependant on choice



Assignment No. 7.1-2

Unit 7.1 Organisation of Tech/Voc Workshops/Laboratories

To be completed and returned to your Tutor for assessment.

This is an Open Book assignment and you may refer to whatever resources you have at your disposal.

Name: _____ Due Date: _____

Question 1

For your own subject area, draft a floor plan of a suitable technical/vocational workshop or training kitchen using the attached worksheet 7.1A.

Support your workshop plan with written comments on how you incorporated each of the following factors into the organisational planning of the workshop:

1. Workspace considerations
2. Equipment placement
3. Storage arrangements
4. Environmental considerations
5. Safety
6. Suitability for competence-based student centred training or teacher centred training, depending on your choice.
7. Disposal of waste
8. Recycling of materials pertinent to the area
 - The floor plan to be drawn to scale.
 - Your written comments should contain approximately 500 words.

Worksheet 7.1A

Use the grid below to plan a practical area for your subject. Assume you need to have places for 15 trainees. Show the position of desks, work areas, chalkboards, tool rooms and internal walls.

[illegible]