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ABSTRACT

This book provides teachers of English for speakers of other languages and adult basic education with practical teaching strategies that can be applied across a broad range of vocational courses. It provides guidelines for setting up tutorial support within the context of Technical and Further Education (TAFE) vocational courses in Australia. Section 1 covers the purpose of tutorial support, independent learning outcomes, learning needs, the learning environment, setting up tutorial support, and team teaching. Section 2 on teaching tutorial support addresses planning a program and describes a model for teaching tutorial support. Section 3 describes the following: English language and literacy strategies for developing oral language and listening competence; notetaking; organizing information; engaging with written text in trade courses; extracting meaning from written text; understanding and answering written questions; study guides for technical courses; written assignments; and dealing with personal issues. Section 4 on maths strategies discusses examples of student difficulties and planning tutorial support. It describes strategies for problem solving, using a calculator, assisting students with their drawing skills, remembering formulas, relating the abstract to the concrete, and exploring how formulas are developed. Appendixes contain 25 references, sample literacy and numeracy screens, skills checklist, curriculum support documents, and index. (YLB)

STRATEGIES FOR SUCCESS

Developing English Language, Literacy and Numeracy in Vocational Courses

Foundation Studies Training Division
Western Sydney Institute of TAFE

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Strategies for Success

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FOREWORD

In recent years there have been a number of developments affecting the roles of Adult Basic Education (ABE) teachers and English for Speakers of Other Languages (ESOL) teachers in vocational and workplace education.

As a result of the National Training Agenda, training has been extended to new areas. Jobs that were previously open to people with limited formal education and English language are now demanding further training with higher levels of communication and mathematical skill. The *National Collaborative Adult English Language and Literacy Strategy* (ALIO 1993), the *National Framework of Adult English Language, Literacy and Numeracy Competence* (ACTRAC 1993) and the *National Reporting System* (ANTA 1995) all emphasise the interrelationship of English language, literacy and numeracy and the need to integrate these areas of competence with vocational and workplace education.

Flexible delivery is also increasingly required as a mode of delivery of training. A side effect of flexible delivery has been an increase in the quantity of print based learning resources and subsequently an increase in the language, literacy and numeracy demands placed on students and trainees.

In TAFE NSW the provision of language, literacy and numeracy support for vocational students is known as Tutorial Support. The aim of Tutorial Support is to develop underpinning skills within the context of vocational courses and workplace training. ABE and ESOL teachers have been supporting TAFE vocational students for many years. During this time a range of material has been developed to support specific courses. Some has appeared in publications but most of this good material lies hidden in filing cabinets and teachers' folders. The project that led to the publication of this book attempted to document the best practice of a group of experienced ABE and ESOL teachers.

The purpose of this book is twofold:

1. Primarily the aim is to share with ESOL and ABE teachers a sample of practical teaching strategies that can be applied across a broad range of vocational courses. It is impossible to provide strategies for all situations in all courses, so it is hoped that the strategies presented here will provide teachers with ideas and models for developing their own strategies.

2. A secondary aim of this book is to set out some guidelines for setting up Tutorial Support within the context of TAFE vocational courses. As with the teaching strategies, it is hoped that these guidelines can be adapted and modified to suit other educational and training contexts within which Tutorial Support takes place.

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SECTION 1

THE CONTEXT OF TUTORIAL SUPPORT

Purpose of Tutorial Support

Tutorial Support involves working with students who need to develop language, literacy and numeracy competence to perform the spoken and written tasks necessary for their course*. The role of the Tutorial Support teacher and the vocational teacher is not only to assist students to perform tasks independently and in some instances collaboratively but also to help them learn how to learn or become independent learners.

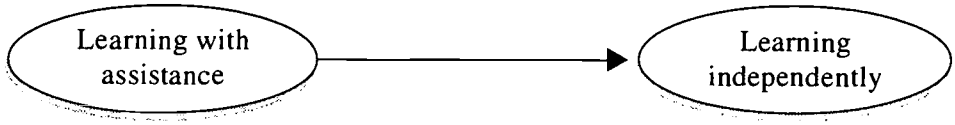


Figure 1

Independent learners are able to stand back and look at the task which is set, analyse it and identify several possible strategies for completing it. Then, as they engage in the task and try out their selected strategies, they reflect on how well a particular strategy is working and, if necessary, modify or change it. (Bull & Anstey. 1991 p. 45)

Independent Learning Outcomes

The learning outcomes for Tutorial Support will largely depend on the language, literacy and numeracy demands of the vocational course. However, to engage independently with the learning processes and performance tasks of a course students should be competent in the following areas:

- linking their experience (concrete) to theoretical texts (abstract);
- asking questions and seeking clarification;

* See *National Framework of Adult English Language, Literacy and Numeracy Competence–Application to ABE Curriculum Development*, ACTRAC, Sept 1993.

- reading and interpreting written texts;
- selecting and using the most effective strategies for interpreting text;
- understanding and using technical language, both spoken and written (including understanding and contributing to classroom discussion);
- thinking systematically;
- understanding assessment and assignment questions;
- answering assessment and assignment questions including maths problems;
- studying.

Although a Tutorial Support teacher may focus on particular areas according to the learning needs of individual students, the above competencies are not discrete. An effective Tutorial Support teaching program develops each area in tandem with all the others. However, lack of competence in any one of the above areas can be a barrier to a student's success in a course.

Learning Needs

Linking concrete to abstract

Some students have difficulty seeing the connections between the concrete world of their experience and the more abstract world that is talked and read about in theory classes. The problem is often one of language. For both English speaking background (ESB) and non-English speaking background (NESB) students, the language of the theory classroom, especially the written language, is different in its structure, grammar and sometimes, use of terminology to that used in workplaces or practical situations. Students unfamiliar with this more abstract English can have difficulty recognising how what is written or said is connected to their experience and knowledge. How often have we heard students say, 'Oh, is that what it means!' Perhaps what they are saying is, 'I have this knowledge but I don't understand that way of expressing it.' For some non-English speaking background students the spoken language can pose an even greater problem than written texts. (See Asking questions and seeking clarification and Using a specialised language below.)

Asking questions and seeking clarification

Many vocational teachers assume students will ask questions if they need assistance or clarification. Most NESB students find it extremely difficult to do this. For both ESB and NESB students, it can be embarrassing to ask questions about basic concepts or words which everyone else seems to

understand. This is even more the case when the vocational teacher is having trouble understanding the questioner's accent or way of phrasing the question.

Another major deterrent to asking questions is that questioning or interrupting teachers is seen as rude or inappropriate in many cultures and these barriers are not easy to overcome. Furthermore, a certain level of English is required to be able to participate in discussion. A student needs to be able to listen, 'digest' ideas and formulate a comment or question in the short space of time before the class moves on to the next phase of the lesson.

Team teaching provides opportunities for the ESOL and ABE teacher to model questioning techniques including how to interrupt and paraphrase, especially when the vocational teacher gives positive responses and encourages questioning. This team teaching strategy can be of great assistance in helping both ESB and in particular NESB students seek the clarification they need in vocational classrooms.

Reading and interpreting written texts

Vocational students are confronted with a whole range of texts (board notes, handouts, course notes, textbooks), many of which may be unfamiliar. Texts that vary in style, quality and technicality can also present difficulties for students. Many students who seek Tutorial Support lack confidence in themselves as readers and writers. This lack of confidence and experience can cause difficulty when learning to interpret a specialised form of written English. NESB Students may be competent readers and writers in their first language but lack confidence in their ability to transfer these skills to English.

Unfamiliarity with the context of a written text is a barrier to comprehension. Although many TAFE students (for example apprentices) spend the majority of their week in the workplace, others come to their courses with little or no workplace experience. Some courses assume that the student has prior knowledge of concepts from the pure sciences (for example Physics or Chemistry) yet the student may not have studied these subjects at school.

Texts involving maths occur in specific calculations modules and in more topic oriented modules. The calculations modules are often designed firstly to revise and test the mathematical skills of the students, and then to build on these skills by applying them in a technical context and/or extending the maths further. Students must be able to read and understand the written instructions that describe how to do the maths, and then apply these methods to examples. When revising, these examples often include texts that are mostly mathematical, for example lists of calculations to be completed with or without a calculator. When applying the maths in context or extending it, the text usually involves much more written language to interpret. Difficulties

students encounter include understanding and following instructions, remembering school maths, using a calculator, doing calculations without a calculator and applying maths in context.

Selecting and using the most effective strategies for interpreting text.

Students need to be clear about the purpose for reading any text. Many students think course texts must be read from beginning to end. NESB students particularly tend to think that they need to understand every word in every sentence. As a result they lose sight of the purpose of their reading and become overloaded with information. Teachers need to give very explicit information about how the students' texts are structured and how features such as headings can help the reader skim, scan and select information that is relevant for their purposes. An emphasis on ideas and understanding is very different from the emphasis that other cultures may place on memorising and reproduction. Teachers working with NESB students need to help them explore and identify these differences so that they are clear about what is expected of them in their vocational courses. Being able to analyse the purpose of the text itself (critical literacy) can also help students interpret a text.

Texts often provide a variety of mathematical information, some of which is relevant and some of which is extraneous to the issue at hand. To select the appropriate information, students need to be clear about their purpose. However, many students tend to make assumptions about what is needed without reading carefully to check the purpose or seeking clarification of the task from the teacher.

To use the information provided, once again the purpose has to be clear. Then the student can choose an appropriate method to achieve that purpose. Matching method to purpose is a source of difficulty for many students.

Successfully using mathematical information also requires students to form an idea of what the outcome is likely to be. Many students have no informal methods of checking the appropriateness of their answers.

Using a specialised language

Speaking and listening

There are many genres or forms of spoken language used in classrooms, from informal discussion through to instructional language and lecture. Many NESB students miss the important distinctions between these spoken language forms or patterns. When they have not realised that the lesson has moved

on, students can miss instructions or conversely they can treat every part as equally important and be straining to take it all in or to take notes. These students may be relatively more confident in dealing with written texts that allow them to check for meaning at their pace. The pressure of oral delivery in another language can be very unnerving. Students have described a cycle of panic setting in as they begin to lose the thread of what someone is saying. Once they have missed a few key words, they begin to feel disorientated. After a certain point, the more they try to concentrate, the less they understand.

When listening, NESB students are often battling with the volume and speed of information, density of language and unfamiliar technical language. Lack of confidence with the language and with notetaking puts great pressure on listening. It is a big task to listen, interpret or translate and also take notes. Many miss out on content because they are trying to write. Others end up just listening and then have no notes for follow up or study.

All these factors cause stress which further decreases the student's ability to understand. ESB students can also have difficulty if the spoken genres used in the classroom are unfamiliar.

NESB students can have particular problems acquiring the technical terminology and grammar of the specialised languages of their course. Native speakers generally don't have problems using technical terminology in the oral mode, if it is associated with their practical experience, for example, the names of tools, equipment and procedures. Regardless of their background, some will have difficulty with the more abstract terminology that they come across in theory that is not directly related to practical experience.

Speaking to writing

Some students have difficulty linking the words they hear with the way a word looks when written down. Some English and non-English speaking background students, whilst very competent at expressing meanings using technical terminology, have difficulty recognising those same words in written form and thus have difficulty writing down language that they are able to express orally. Such students may be inexperienced with reading and writing technical English. Others need someone to help them make the connections.

At the sentence and whole text level some students need to be made explicitly aware of the differences between spoken and written language. These are the students who tend to write as they speak and/or have difficulty with the way that knowledge of their vocation is represented in writing. By this is meant not only the technical words but the unfamiliar grammar and structures used in the written language of their trade or discipline area.

Writing to speaking

Some NESB students who have learned English as a foreign language can be quite competent at reading and writing English but, due to lack of exposure, may have difficulty comprehending and using spoken English. Vocational teachers can wrongly assume that a student who is a competent reader/ writer is just as competent with the spoken forms of the language. The students themselves may not initially be aware that it is this disparity between their reading/writing and their listening/speaking skills which is causing them frustration. They often have unrealistic expectations about how quickly their speaking and listening skills will catch up with their reading and writing skills. Interview procedures which assess oral comprehension and speaking competence are therefore an essential part of assessing the needs of NESB students.

Writing

Some students lack knowledge and experience with the writing expected of them in their course or in the workplace, where they are expected to master various text types and genres. An effective Tutorial Support teacher needs to become very familiar with the structures as well as the linguistic and grammatical features of these texts. A knowledge of Systemic Linguistics, particularly the structures and features of scientific and other specialised forms of English, will assist teachers in analysing the highly specialised texts found in vocational courses and also enable them to become more explicit about what the students need to learn.

Thinking systematically

Many Tutorial Support students need assistance to move from expressing their knowledge in concrete ways to the more abstract, scientific and systematic ways of organising knowledge in their discipline area. For example, stage one Parks and Gardens Trade students, when studying the topic, Autumn Foliage Plants, need to be able to:

- define what a deciduous plant is;
- list and describe environmental conditions that provide good autumn foliage colour;
- describe the uses and advantages of growing autumn foliage trees; and
- name examples of autumn foliage trees.

As well as organising their knowledge according to the above categories, students need to be able to categorise each plant or tree according to the

botanical classification system (size, shape, leaf shape, flower shape, inflorescence and so on). They need to do this so that they can select an autumn foliage tree that will fit certain client specifications as well as grow well in the environmental and climatic conditions described. In naming plants, students are required to use a binomial system of nomenclature which is based on Latin—a language that many students find alienating.

In vocational courses such as Parks and Gardens Trade, students, although understanding particular pieces of content, can flounder in their assessment tasks if they lack strategies for bringing together information and organising it in the ways required by the discipline area.

Understanding assessment and assignment questions

Assessment and assignment questions ask students to express their knowledge in a particular systematic way, for example, through definitions, processes, functions, advantages, effects and so on. Some students are unfamiliar with assessment or assignment genre. They do not know to ask themselves:

- What is this question asking?
- How do I do a multiple choice, essay, short answer, matching, or true/ false task?

Maths assessment questions usually call for different skills to those the student uses in the practical section of their course. Students must have practice in understanding and interpreting what is required by different types of questions. Different courses use different assessment methods, and the Tutorial Support teacher must find out about them and demystify them for the student. For example, in multiple choice questions, often an approximation is enough to work out which is the correct response.

Answering assessment and assignment questions

Although most students are confident that they can become skilled in the hands-on tasks of their trade or vocational area they are not as confident about doing the assessments or assignments in their course. Getting them to feel confident about understanding assessment questions or assignments and writing down what they know can be a major achievement.

Many Tutorial Support students have difficulty writing down their knowledge in a form that will be seen as answering the question. Many ESB and NESB students have difficulty moving from oral to written language. The difficulties for ESB students can stem from poor literacy and spelling to the problem of giving too brief an answer or not being explicit enough. Systemic linguists

would see such students as having difficulty with 'mode'. These students are competent at expressing their knowledge within the workplace context or with fellow workers who understand the context very well. In an assessment or assignment however, they are expected to write what they know away from the context. Many are inexperienced at doing this in either spoken or written language. Both the vocational and the Tutorial Support teacher need to give such students opportunities to talk and write in a mode that is more like written than spoken language (i.e. more abstract or incongruent).

NESB students in particular and some ESB students are likely to have difficulty with culturally different expectations as to structuring written answers. They usually need to have the teacher's expectations made quite explicit before they can approach a task with confidence. Giving their own opinion and justifying it is quite foreign to many NESB students' previous study experiences. Sample answers written by vocational teachers or more competent students can be invaluable in helping them to understand what is expected of them.

With maths problems, as with any technical text, some students will have difficulty with technical vocabulary and/or the style of writing. Before they start to think about the maths, they need to understand the context and interpret the questions being asked. The mathematical information in a text then poses particular problems.

Students have to decide:

- which information is relevant/irrelevant to the questions asked;
- which information has to have its form changed, for example metres to millimetres;
- which method or formula to use to get the required answer; and
- the steps and sequencing needed to solve the problem.

They then have to:

- make a rough estimate of the outcome;
- calculate an answer;
- check this against a reasonable estimate; and
- refer back to the text to ensure that they have answered the question asked.

This requires sophisticated use of both the language and the maths in the text.

Studying

Many Tutorial Support students do not have an effective system for studying. They often have not acquired the organisational strategies necessary to produce their own summaries and worksheets that help make studying easier. Nor do they have effective systems for memorising and learning for assessments. In order to do well in assessments, especially those with short answer/multiple choice format, students need to:

- develop an effective system for memorising and recalling information;
- learn to understand what assessment questions mean; and
- practice and become fluent at expressing their knowledge in writing.

The Learning Environment

Students in TAFE courses can come from very diverse cultural and/or linguistic backgrounds. For some there can be a frustrating gap between their background experiences and the institutionalised culture of learning in TAFE. Likewise, the language demands placed on them in their TAFE course can be quite different from their previous learning environments and the gaps may be too wide to bridge on their own.

At the outset it is valuable for the Tutorial Support teacher who is planning a program to be aware of not only their own cultural and language background but also the backgrounds of the vocational teacher and the students. What some might see as constraints placed upon students and teachers, others might see as differences in cultural background, language expectations and experience. For our purposes we will view TAFE as a learning environment which places certain cultural constraints and linguistic demands on students. Fran Jelley describes some of the issues under the broad (and in the real world inseparable) categories of culture and language. It is not the intention here to suggest strategies for dealing with these issues but rather to raise awareness. (See *Cultural differences* and *Language needs* below.)

Cultural differences

Student expectations

Some NESB students expect the teacher to work through a textbook from beginning to end. They may not be used to photocopied handouts that can seem unrelated.

Some students may feel that class time is being wasted on talking when the teacher constantly requests feedback on material just delivered. Others may be unaccustomed to classrooms where students are expected to ask questions and seek clarification, seeing this behaviour as a mark of disrespect towards the teacher.

Other classrooms have a learning culture that does not encourage questioning. Students used to learning through questioning at school or in their workplaces may have difficulty learning in such an environment.

The gender of the teacher or class members may pose difficulties for some students. Students may come from a socioeconomic group or minority group where they are the first in the family or community to go on to further study. They may have no idea what to expect, having no models to learn from and no one from their culture to advise them. They may also be experiencing hostility from their family or community who see them as rejecting their class or culture in aspiring to a particular career or educational level.

Some younger students have difficulty adjusting to the TAFE environment where students are expected to be independent in meeting deadlines and organising their own work and study. Such independence may not have been expected of them at school.

Mature age students need time to learn or relearn the skills needed to succeed in an institutionalised learning environment, such as time management, study techniques and independent learning strategies.

Learning and assessment tasks

TAFE students are often required to extrapolate from the narrow base of the subject to the wider world, including their own experience. In some cultures, the student is not required to demonstrate a personal response to the subject and may resent having to do this. Many graduates from overseas expect to get the Australian equivalent of A-level results when they are already familiar with the subject matter. It is very irritating for them to be asked to make subjective judgments. They may even say, 'I don't think this is what we should be doing.'

Political experiences in a student's home country can result in the student being unhappy with either the subject matter or expected responses for an assignment. For example, some students come from countries where political and philosophic pluralism are not held up as virtues but as vices, so having to objectively discuss both sides of a moral, historical or social issue can be problematic.

Some students can have difficulty with continuous assessment. To some NESB students these tasks may appear trivial and unimportant because they do not represent 'important tasks' in their home country.

Both English and non English speaking background students can come from cultures or backgrounds where learning is based on concrete experience. They are not experienced in learning through abstract contexts, nor are they familiar with or experienced in using the abstract language associated with this kind of thinking.

Classroom management and teacher expectations

Most TAFE classrooms have a lack of formality which can be very discomforting for some NESB students. For example, many TAFE teachers expect students to refer to them and the other students by their first names. Students are sometimes expected to work in pairs or groups with their responses incorporated by the teacher into the body of the lesson in an ad hoc way. For some NESB students this appears as disorder, time wasting and even weakness on the teacher's part. The student may report dissatisfaction to the Tutorial Support teacher based on a faulty assumption of what the teacher's goals and expectations are.

Language needs

All TAFE courses introduce students to the culture of a particular workplace and this involves becoming competent in using the highly specialised forms of language of that work culture. These forms of language do not just consist of specialised vocabulary or technical terminology. Each trade or workplace has its own genres, grammar or ways of expressing meanings. Some students have difficulty learning the specialised languages of their course or workplace. This can be due to their lack of experience with the English language in the case of NESB students. Native speakers may have little experience of more abstract, technical forms of English (written or spoken) due to their socioeconomic background, non standard cultural background or lack of experience with these forms of language at school.

As well as the language of the workplace, students need to become competent with the languages of an institutionalised learning environment. Each TAFE course has its own ways of organising information which can be quite different to the way information is organised in the student's workplace. For example in the workplace, meanings may be expressed in technical yet concrete language whereas at TAFE students may be required to express more in-depth, theoretical understandings in more abstract language.

Many TAFE courses are now composed of short modules and it is often assumed that certain terminology has been explained in a previous module. Students can also have difficulty when colloquial terms are used in the classroom in place of the terminology found in the course notes or textbook. A glossary of terms and a table of synonymous expressions can be an invaluable resource for such students.

For students having difficulty with maths, the problem can be a language rather than a maths problem. For example, students have to work out what is being asked, choose the appropriate formula or procedure, then select appropriate information from the question and use it appropriately in the procedure.

The language of assessment (including teacher questioning, exam and assignment questions) is like a foreign language for some students and they need assistance to learn this highly specialised form of English and how to respond appropriately.

Each course area has particular genres, text types and grammatical forms that occur regularly. Analysing the features of the specialised languages of a particular course is therefore an important part of a teacher's preparation for Tutorial Support. For example, a knowledge of the imperative form is indispensable in Hospitality courses for writing recipes and instructions. A knowledge of the passive voice is necessary in engineering and other trades for process description.

Setting Up Tutorial Support

Liaison with vocational teachers

Adult Basic Education and ESOL teachers need to liaise and negotiate with vocational teachers to support students who are having difficulty applying maths and comprehending and producing oral and written technical texts. ABE and ESOL teachers are also responsible for initial literacy/numeracy assessment of new students and assisting vocational teachers to develop teaching strategies and resources that integrate language, literacy and numeracy with vocational content.

Successful liaison is not something that happens overnight. An enormous amount of time is often spent getting to know vocational teachers, their teaching styles, attitudes and views on learning. Liaison is really about building up relationships on a personal level, bridging gaps and forging strong links. You may have to communicate with people who have a different view of learning and who may come from a very different background. Vocational

teachers have different constraints on their time to ABE/ESOL teachers and aren't always aware that they are actually teaching language as well as content. There can sometimes be the assumption that once the students are referred to the Tutorial Support teacher they are no longer the vocational teacher's responsibility. Vocational teachers may feel intimidated by Tutorial Support teachers and often the Tutorial Support teacher feels intimidated at the prospect of approaching vocational teachers in their working environment. Therefore it is vital that Tutorial Support teachers have certain attributes that extend beyond their teaching ability.

Successful liaison depends on:

- a strong motivation to succeed;
- willingness to be flexible with programming;
- an ability to adapt to all kinds of teaching/learning situations;
- acceptance of different methodologies and philosophies;
- sound knowledge of theory and practice in teaching language/literacy/maths balanced with the ability to accept the vocational teacher's approach;
- people skills;
- patience;
- perseverance;
- an ability to talk on a variety of subjects and levels;
- knowing when to back off, back down or keep going;
- diplomacy;
- timing;

As well as liaising with the vocational sections it is important to liaise with other sections that provide Tutorial Support in order to coordinate services, advertising, referrals and so on. Liaison with student support services provided by counsellors, disabilities consultants, Aboriginal coordinators, multicultural coordinators and course information officers is also essential to ensure that students are offered the most appropriate provision and support. Teachers who work and/or liaise with the above personnel and vocational sections agree that they have gained professionally from the shared expertise that results.

Raising the profile

Below is a list of strategies that have been used to raise the profile of Tutorial Support and team teaching and raise awareness of language, literacy and numeracy integration issues.

- Consultation with section/college/campus and faculty managers.
- Making team teaching and Tutorial Support a part of local access and equity plans.
- Taking part in course planning activities, for example Labour Market Programs.
- Keeping track of new initiatives where there are likely to be students with language, literacy or numeracy needs, for example, mature age, NESB, Aboriginal and disabilities students, long term unemployed, early school leavers and courses with a heavy reliance on self paced materials.
- Running staff development programs such as *Working Together* and *Teaching in the Multicultural Classroom* (available from Foundation Studies Training Division TAFE NSW).
- Organising staff development programs on team teaching and Tutorial Support for ESOL and ABE teachers.
- Documenting pass and retention rates. An increase could be used to show the cost effectiveness of Tutorial Support or team teaching.
- Offering assistance rather than waiting for referrals or requests for help. Preparing a handout about what team teaching or Tutorial Support can offer a section and presenting it to a group of vocational teachers at a lunch, morning tea or section meeting has been found to be a time effective means of communicating.

Initial assessment

Purpose

Once students have been accepted into a course, initial assessment can take place during enrolment or at the beginning of a course. Some colleges screen all Stage 1 apprentices, students in Labour Market Programs and other selected courses. Initial language, literacy or numeracy assessment can serve the following purposes:

- To establish the language, literacy and numeracy needs of a group of students. For example is there a need for bridging sessions before introducing certain topics?

- To establish existing skills that students have. Do these match the underpinning skills that they are expected to have?
- To improve retention rates by providing a means for targeting students who are at risk of failing their course if they do not get immediate assistance.
- To target students who will need assistance with certain aspects or stages of their course.
- To inform students of support services and give them an opportunity to request assistance or seek reassurance.
- To inform vocational teachers of the support services available.

Limitations

Initial assessments of language, literacy or numeracy cannot predict student success in a course and therefore, from an access and equity perspective, should never be used to select students for a course. They cannot measure critical factors such as motivation, nor determine whether the student uses effective study techniques.

Assessment procedures

Literacy assessments should use text types similar to those found in the course and engage students with the types of reading and writing tasks that they will need to perform during the course. Numeracy assessments should select underpinning skills needed to perform the maths components of the course. Many teachers are tailoring numeracy and literacy assessments for particular courses. These assessments look at prerequisite and underpinning skills in a context that is relevant to the course but does not test knowledge of course content. See Appendix A for examples of tasks used for initial assessment.

One difficulty with initial assessment is that unless the Tutorial Support teacher is present in the classroom during the first few weeks or gets an opportunity to interview each student (rarely feasible) it can be difficult to identify students having difficulty with listening and speaking. It can be particularly difficult to identify NESB students with good literacy skills but poor listening and speaking skills. The vocational teacher can be encouraged to develop strategies for early detection of students who may be having difficulty understanding and speaking the oral language of the course.

Most teachers have been using formal Literacy/Numeracy screens which are administered like a test. In the Geo-Technical Field Operations Certificate, a technique has been developed which promises to be far more relevant, valid

and less threatening for students. The language/literacy/numeracy (LLN) screening procedure is part of a separate orientation module, undertaken in the first week of the course. The module integrates a LLN screen, self assessment by students of their LLN needs, and tasters of what the course is all about. Students undertake various tasks, games and problem-solving activities that reflect the types of skills needed in the course and in the workplace. Also the screen goes beyond the anticipated LLN skills needed. Students are able to solve problems, discuss, work in teams, express themselves, find alternative methods and use previous knowledge and experience, in the context of the course content. In this way it is a truly integrated and contextualised assessment.

Orientation modules such as the above and LLN screens should only serve the purpose of initial assessment. Ongoing assessment of needs and demands should also be part of the Tutorial Support program. Once students have been in a course for a few weeks the most effective assessment procedure is to monitor performance in the course. Course assignments, class tasks and assessments are the best indicators of LLN demands, student performance and student needs.

Referral

Results of initial assessment should always be discussed with the vocational teachers and their section managers. Following the initial assessment, recommendations can be made regarding options for delivery of Tutorial Support. For example, if a significant proportion of the class is experiencing similar numeracy difficulties then team teaching may be the most appropriate option.

At later stages in a course students may be referred by the vocational teacher or decide of their own accord to seek support. Likewise a vocational teacher may decide during a course that students would benefit from team teaching. Students and vocational teachers need to know that the option of Tutorial Support is always available.

Students identified at risk need to be interviewed individually to discuss their difficulties and the options available for tuition. Each student must take responsibility for deciding whether or not to take up Tutorial Support. It is important however for students to realise that difficulties need to be addressed before they become major problems. Be sensitive to the fact that some students may feel embarrassed about needing support. Privacy and confidentiality are therefore extremely important.

Options for delivering Tutorial Support

There are four ways that Tutorial Support can be delivered by ABE and ESOL teachers: team teaching, one-to-one tuition, tutorial groups and drop in assistance.

Team teaching

Team teaching is particularly effective for integrating maths and specific language/literacy within the context of the course content. A recent survey found that, 'The most common model of team teaching involves an ABE/ESOL teacher and a vocational teacher operating in the context of the vocational classroom.' (Hogan, 1994)

With increasing attention being paid to integrating language, literacy and numeracy into vocational courses, team teaching is becoming a built-in requirement of some courses.

One-to-one tuition

This option is used for especially disadvantaged students or where there is one student in the group needing special or intensive assistance. Tuition time needs to be negotiated carefully because the student must make a commitment to attend regularly. One-to-one tuition should continue no longer than absolutely necessary.

Tutorial groups

These vary in size and require balancing the needs of a number of individual students. Common needs and priorities should be addressed in the tutorial time. Detailed individual feedback could be given outside tutorial time in writing, on tape, by telephone or in a one-to-one meeting. It has been found that the most effective tutorial groups contain students with similar needs from the same courses and course stages and the mode is mainly self-instructional with teachers available to assist.

Drop in

Adult Study Centres and Individual Learning Centres provide drop in assistance. Those who enrol need to be more independent as students from several courses may be present at any one time.

Flexible delivery

Flexible delivery provides variations of the above via TAFE's Open Training and Education Network (OTEN). Students can gain assistance via phone (with the potential for teleconferencing and videoconferencing), computer link, fax and mail.

Ongoing liaison

For team teaching and other modes of Tutorial Support to be successful ongoing professional liaison between ESOL/ABE teachers and vocational teachers is critical. Liaison is necessary to increase the awareness of vocational teachers and section managers of the potential not only of Tutorial Support but also of team teaching. One success in a college or section can be the springboard for more success. Likewise, success with one teacher can help to win over other teachers in the same section. Even in ABE and ESOL sections one teacher discovering the rewards of successful Tutorial Support or team teaching can provide encouragement for others to take up the challenge.

ABE/ESOL teachers who are supporting students either on a 1:1 basis, in a small group or in team teaching should liaise regularly with the vocational teacher to:

- maintain an effective working relationship;
- collect information about the course;
- gather resources that students will be using;
- monitor progress of students;
- solve any difficulties;
- ask for advice;
- suggest options or alternatives for teaching strategies (only after getting to know the vocational teachers and feeling comfortable with them); and
- improve delivery.

A good working relationship with the vocational teachers will greatly enhance the success of Tutorial Support. Tutorial Support teachers need to:

- share with vocational teachers what they are doing with the students;
- make it clear that they are not there to teach the course content;
- be realistic about what they can do;

- keep reinforcing the point that the vocational teacher is also a language/ literacy teacher as language is the main medium of instruction; and
- show interest in the vocational area by attending classes or going to the workshop during a practical session.

Visits to the vocational classroom assist Tutorial Support teachers to learn more about the course and also allow them to see the students in a situation where they can demonstrate knowledge and skills that cannot be demonstrated in tutorial sessions. Some Tutorial Support teachers have gained release time to attend practical sessions and workplaces through 'Return to Industry' programs.

The vocational section manager and the ABE/ESOL coordinator (or the teacher responsible for Tutorial Support in a particular vocational area) should always be kept informed of student progress and any difficulties that may arise.

Team Teaching

The information in this section is largely based on the results of a survey conducted for Foundation Studies Training Division by Trevor Hogan (1994). His report summarises feedback from a selection of ABE and ESOL teachers and can be regarded as a good basis for organising, planning and implementing successful team teaching.

Advantages

As stated earlier in this book, the prime advantage of team teaching over other options for Tutorial Support is that it develops language, literacy and numeracy within the vocational context.

From the students' perspective, team teaching:

- benefits all students in the class;
- allows difficulties to be addressed at the point of need and in context;
- provides opportunities for immediate feedback;
- provides demonstrations (through the Tutorial Support teacher) of independent learning strategies;
- gives access to different teaching styles;
- provides opportunities to develop skill in asking questions and clarifying information (through demonstration by the Tutorial Support teacher); and

- provides an advocate (the Tutorial Support teacher) for their learning needs.

From the teachers' perspective, team teaching:

- enables teachers to develop professionally through shared expertise;
- enables vocational teachers to gain insight into the language, literacy and numeracy needs of NESB and ESB students;
- enables vocational teachers to gain knowledge of ESOL and ABE methodologies and how to integrate them with vocational teaching;
- enables the ABE/ESOL teacher to gain knowledge of language, literacy and numeracy demands within the vocational context;
- provides opportunities for both teachers to jointly prepare resources; and
- provides the rewards of team effort and shared success.

Planning

Before any team teaching can take place, it is important that both the vocational teacher and the Tutorial Support teacher feel comfortable working together in this form of delivery. Rapport must be built up carefully with the vocational section and then with individual teachers. Sometimes it is a simple procedure, particularly when the teachers involved are confident with their teaching styles. However, it often takes some time to achieve complete satisfaction with team teaching. Trevor Hogan suggests that you start in a small way by taking on short term projects or being involved in a specific part of a longer term project. This allows communication to develop over time and enables participation to increase gradually.

> *My original involvement with the Carpentry and Joinery section at Werrington TAFE was to assist individuals in Stage 1 classes while they were doing their calculations. This grew to identifying students likely to experience difficulty with their maths at the commencement of the course. Team teaching in this section now involves identification and assistance with calculations, recognising and dealing with literacy issues, joint lesson and resource development.* (Hogan 1994)

If team teaching appears to be the best option, negotiation with the section manager and classroom teacher needs to take place to establish appropriate times for teaching and planning sessions. It is crucial at this stage that both teachers negotiate and clearly define their roles and the purposes for team teaching. For example, is the ABE/ESOL teacher's role to be one of facilitator, discussion leader, co-teacher, exam supervisor or teacher's aide? Each teacher may take on different roles at different times. If possible, it is a good idea

for the Tutorial Support teacher to sit in on the class during the planning stage to find out how lessons are conducted and to gain some knowledge of the course content and structure.

Team teachers plan their teaching sessions in various ways from informal meetings during tea breaks and after class to formal planning meetings at set times. Regular meetings are essential for the success of team teaching. Such meetings enable teachers to:

- plan content;
- clarify content;
- identify aspects of language, literacy and numeracy competence and incorporate their development into the course content;
- plan teaching strategies;
- plan study skills (learning to learn) activities;
- set time frames;
- gather resources, for example curriculum, course texts and handouts, old exam papers and assignment questions;
- identify and discuss skills, concepts and strategies;
- plan and evaluate screening and assessments;
- clarify and negotiate responsibilities;
- review progress and discuss issues and concerns; and
- report to the coordinator and other stakeholders.

Classroom management

Below are examples of how some ESOL and ABE teachers have managed their teaching team.

- Vocational teacher and team teacher deliver lesson material alternately. This can involve the vocational teacher presenting content followed by the ESOL/ABE teacher clarifying or focusing on the language/numeracy requirements relating to that content.
- One teacher teaches whilst the other teacher clarifies by making board notes or summaries as appropriate.
- ABE/ESOL teacher plays the role of student, demonstrating and modelling how to ask questions to clarify content.

- ABE/ESOL teacher leads and encourages discussion.
- ABE/ESOL teacher makes notes for distribution both as a content resource and model.
- Both teachers are jointly in charge but with different roles. Experienced team teachers with a good working relationship happily 'butt in' on each other at appropriate points in the lesson.
- ABE/ESOL teacher responds to needs as they arise, that is, using an event that occurs incidentally in the classroom as the focus for the support teaching.
- ABE/ESOL teacher assists with organisational tasks.
- ABE/ESOL teacher gives individual assistance where needed.

It is important in any team teaching strategy that each teacher is continuously involved in the teaching.

Success factors

Information gathered from teachers experienced in team teaching suggests that the following factors can influence the success of the team teaching exercise.

- Willingness to cooperate and learn from each other.
- Willingness on the part of the ABE/ESOL Tutorial Support teacher to understand the context and culture of the vocational area and a recognition by them of the limits and possibilities of using their expertise within this context.
- Recognition and respect for each team teacher's area of expertise.
- Trust between team teachers.
- Willingness to be flexible.
- The ABE/ESOL teacher focusing on the essential needs of students and acknowledging the demands and time constraints of vocational courses.
- Acceptance of the team teacher's methodologies and approaches to teaching.
- Flexibility in lesson delivery.
- A clear understanding of each teacher's role by the team teachers and the students.
- Two-way, constructive feedback between the team teachers.

- Regular planning and evaluation meetings.
- Joint preparation of resource materials.
- Availability of content material to the Tutorial Support teacher well before the class.
- Ongoing monitoring and needs assessment by the Tutorial Support teacher.

In the conclusion to his report on team teaching Trevor Hogan (1994) states that, team teaching encompasses the concept of a team, working together, combining effort and using complementary expertise for a common purpose.

SECTION 2

TEACHING TUTORIAL SUPPORT

Introduction

This section covers only a selection of strategies appropriate for Tutorial Support. The focus is mainly on Trade and Certificate level courses as there seems to be a lack of resources for both students and teachers in this area. On the other hand there is a great deal of material to assist teachers with language activities such as essay writing, report writing and seminar presentations. Some of the strategies and activities described here however, could be useful lead up activities for the development of more advanced spoken and written language, and numeracy activities.

The primary purpose of this section of the book is to provide starting points for teachers new to Tutorial Support and to stimulate experienced teachers to develop new strategies. Tutorial Support involves teaching within an enormous number of highly specialised courses to students with a wide range of competence in English language, literacy and numeracy. To provide strategies for all such situations is beyond the scope of this book. Strategies and activities were therefore selected according to the following criteria:

- applicable across a broad range of courses;
- adaptable to a variety of teaching situations, for example, team teaching, small group or one-to-one; and
- 'tried and true' methods used by experienced TAFE Tutorial Support teachers with a variety of theoretical backgrounds and approaches, namely Communicative, Whole Language and Genre.

Where specific courses have been referred to, it is to show how the strategies can be applied rather than restrict them to particular courses. Some strategies that describe a one-to-one situation can be applied to small groups and team teaching situations, and vice versa. We hope that you will find strategies here that you can apply, modify and adapt to the teaching situation and the student group you are working with.

Planning a Program

Before deciding on appropriate strategies take these steps.

1. Do a course audit. Identify the language, literacy, numeracy and study skills needed to participate in the course.
2. Assess the students to identify existing areas and levels of competence.
3. Identify where the gaps are.
4. Prioritise. (One of the biggest challenges of Tutorial Support teaching is to develop strategies that are effective within the time constraints.)

A skills checklist is provided in Appendix B. This can be used as a guide when doing a language, literacy or numeracy audit. Use vocational teachers, curriculum documents, course handouts, teacher/student manuals, assessment tasks and exam questions for source information. Attendance by Tutorial Support teachers at classes helps them to gain knowledge of language, literacy and numeracy requirements. Some of the more recent curriculum support documents such as those produced for the Local Government Certificates, are very helpful in that they list speaking, listening, writing, reading and numeracy requirements for particular modules. Appendix C gives examples from the modules: *Bookkeeping - Accounts Receivable. Destination and Products - Regional Australia*.

A Model for Teaching Tutorial Support

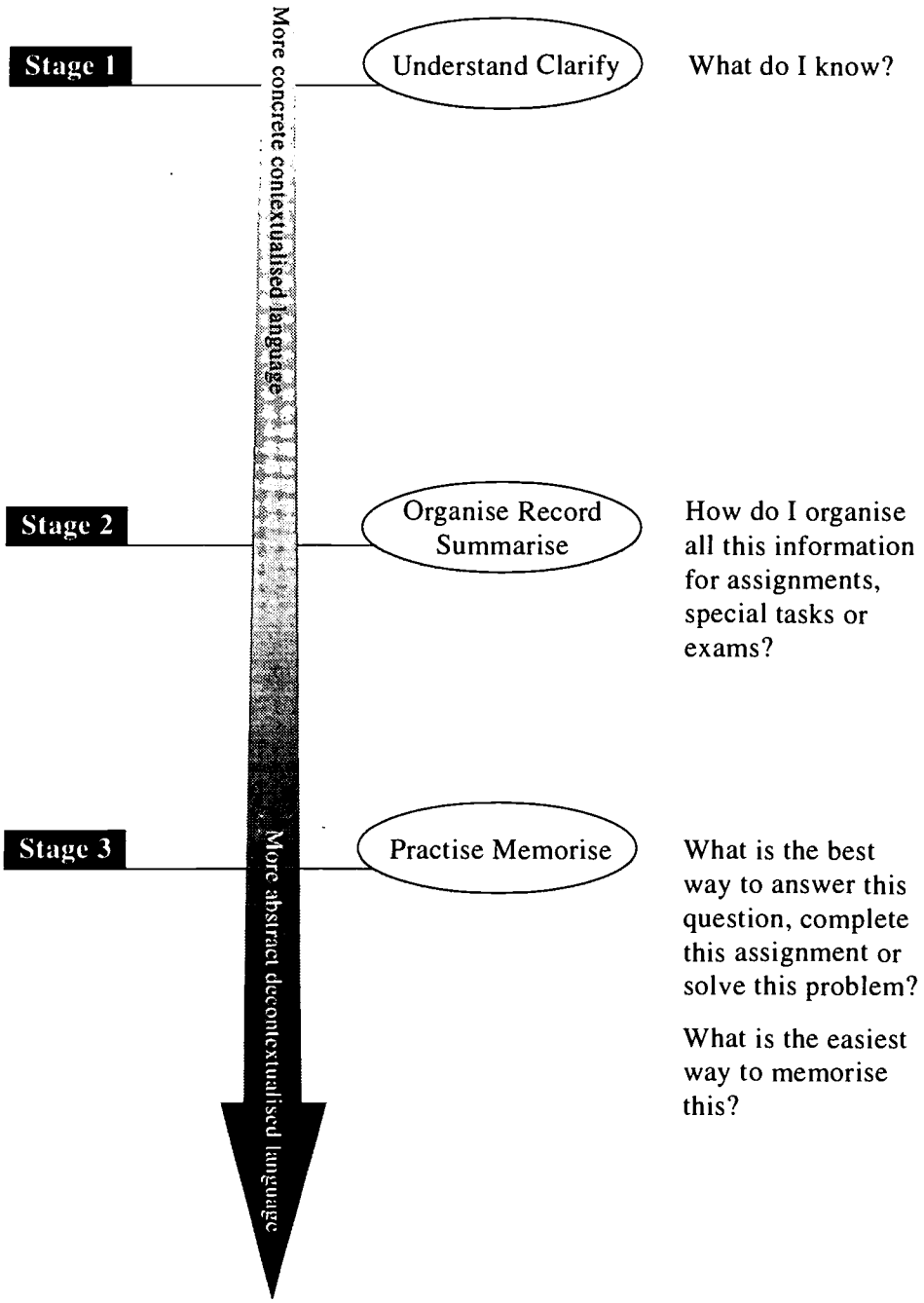
In this section Kathy Salter describes a model developed from her teaching experiences with Trade Certificate students.

The model described below is largely influenced by knowledge gained from whole language pedagogy as well as Systemic Linguistics and Psycholinguistic Theory. What is not catered for in this model however, are students' personal needs, for example, time and stress management, overcoming fear of exams and failure, motivation, confidence building and self esteem. Teaching strategies will fail if these needs are not attended to along with the students' language, literacy and numeracy needs.

An effective Tutorial Support program should ensure that students are developing strategies to become independent learners in each of the three stages described below. They may not need assistance, however with all stages. Although the process is described in stages, there is in fact much overlap and many of the strategies described later in this book combine more than one stage of the process in one activity. The process however is linear in the

sense that a student needs to engage with or attend to the content of a topic in order to understand it or make it meaningful. Only then can the content be organised in such a way that it becomes a useful resource for studying for exams or for the effective performance of certain tasks. A summary of the teaching model is shown in Figure 2.

Figure 2: A model for teachers and students



Stage 1 - What do I know?

In this stage the teacher uses strategies which help students engage with and make sense of the content knowledge of their course. This stage could be seen as similar to what is described as 'building up the field, in the Genre approach to teaching language. (Hammond, Burns et al 1992)

In this stage the focus is on listening, reading, observing and talking. Getting students to express to another person their knowledge of a concept, issue, topic or problem to be solved, helps them interpret, clarify and discover what is not clear to them. Encourage them to draw on understandings they bring to the course as well as course content.

Clarification can come through joint construction of the meanings of written texts (including mathematical formulae and processes). If a student cannot express an understanding clearly or at all, one approach is to read an extract from a textbook or course notes and then ask her/him to explain the vocabulary or concepts in what was just read. If there is still a problem then the student should be referred to the vocational teacher or supervisor. The Tutorial Support teacher's role is to focus on helping students to clarify their content knowledge, organise it and understand how this knowledge is expressed in their discipline area. At this stage some students may need assistance to develop competence in asking questions in class when they do not understand.

Stage 2 - How do I organise all this information for assignments, special tasks or exams?

Many students who need Tutorial Support are overwhelmed by the content knowledge presented to them in class, both orally and in writing. Some, particularly part-time students, have a great deal of background knowledge built up through listening, talking and doing, both at work and at TAFE but they do not have strategies to draw on this knowledge when performing written or oral assessment tasks.

Stage Two of the teaching model involves using strategies that will help students organise knowledge in the systematic ways demanded of their discipline area. To do this effectively, close liaison with the vocational teachers is essential to gain knowledge of the syllabus, assessment tasks and assignment questions. For example, for a particular concept or technical term do the students need to be able to define it, describe it as a procedure or process, list its advantages and disadvantages, describe its functions and/or applications, label its parts, describe how it works, show how it relates to other 'things', and/or calculate it? Examples of strategies that help students

sort out information according to such categories are described in more detail later in this section.

Stage 3 - What is the best way to answer this question, complete this assignment or solve this problem? What is the easiest way to memorise this?

When students have categorised their knowledge, the next step is to write this knowledge in the formats expected in assessments and assignments, or in the workplace. These formats can be of various text types or genres. An effective Tutorial Support teacher needs to become very familiar with the structures and grammatical features of these texts including mathematical texts. A knowledge of Systemic Linguistics (particularly features of scientific language and the schematic structures of the text types found in the student's course material) helps teachers to analyse the highly specialised texts found in vocational courses and exam papers. This knowledge can also help teachers become more explicit about what their students need to know.

Begin by modelling and jointly constructing written texts with students. Through this process the students are being shown how to move from spoken language (more concrete) to written language (more scientific or abstract). Sometimes this involves making their spoken answers more concise. At other times they may need to expand what they have written if it is not explicit enough. Always try to keep the written language as close as possible to the students' ways of meaning. Such language will be more predictable for them and therefore easier to read and study from later. At this stage students are learning the processes for doing assignments, assessment tasks and so on.

Many students need assistance to develop systems for studying, practising and memorising that are efficient for them. Think about the tasks they need to perform during an exam or assessment and then make sure that their study strategies involve practising these tasks and skills. For example, when undertaking an exam with short-answer questions, students need to be able to:

- understand the question;
- recall information; and
- write down their knowledge clearly and concisely.

Students should therefore practise reading questions, recalling information and writing answers when studying for this kind of exam, rather than just reading through their notes.

Students also need to develop strategies for the whole process of preparing written assignments or oral presentations. Analyse and be explicit about the process so that students can become more and more independent in performing these tasks.

An overview

Underlying this model is a hidden curriculum. Students come to Tutorial Support primarily for help with assignments and assessments. Many do not want to improve their literacy and in fact feel alienated from textbooks and technical language (Salter, 1988; Halliday & Martin, 1991, p. 11). However, in the process of helping students achieve their goals they can be guided through a process where their language develops from concrete or contextualised ways of meaning (predominantly oral) to language that expresses more abstract or scientific ways of meaning (predominantly written). It is a process where they are not only developing fluency in the written and spoken forms of specialised languages, but developing cognitively as well.

A Tutorial Support program should also place emphasis on learning how to learn so that Tutorial Support is no longer needed. The teaching model described above attempts to broadly encompass what is involved in this learning process and what is needed in an effective Tutorial Support program. This model has also been used with great success with both large and small groups of students in study skills sessions.

Some of the strategies that follow, in sections 3 and 4, encompass the three stages of the teaching model: others attend to only part of the process.

Section 3

English Language and Literacy Strategies

Developing Oral Language and Listening Competence

The strategies that follow assist students to build up their content knowledge and become competent in speaking and understanding the language of their specialised area of learning (Stage One of the teaching model). Strategies that develop oral language competence also assist students to perform better in oral language assessment tasks such as seminars and oral presentations (Stage Three).

Pronunciation

In this section Marianne Wagner describes some of the strategies that she has developed with NESB students.

Strategy - Analysis of audio tape of written text being read aloud

Many NESB students need assistance to correctly pronounce and use the specialised language of their field of study.

Various techniques can be used to assist students to improve their pronunciation. One of the most effective techniques is to ask the students to record a text of their choice, which they read aloud onto an audio tape. This is done as a homework assignment. The teacher then listens to the tape and makes written notes about aspects of the student's pronunciation, listing examples from their text. These aspects include phonemes, word stress, rhythm and intonation. The teacher then records comments on the audio tape, summarising the key issues for that particular student and reading out the particular examples listed. The whole text can then be read, so that the student has a model to work with.

Remember that in this activity students are reading from a written text which is quite different from spoken language (Hammond, 1990). As written texts are more dense with technical terminology they provide a convenient vehicle for learning to pronounce such words and phrases. However, students should also be given opportunities to engage in real life spoken discourses related to their subject area or field of study, for example discussion, retelling and role play.

The advantage of reading from a written text is that, while a student's pronunciation is still very difficult to understand, the teacher can refer to the written text to understand the student's language. Once the students are at a stage where they can be relatively easily understood on audio tape, they should be encouraged to practise speaking on tape without a script. (See activities below.)

Expressing opinions

Marianne Wagner describes strategies that she has developed with Welfare students.

In some courses students need to become competent in expressing opinions orally as well as in writing.

Strategy - Revisiting class discussions

Ask students to bring discussion questions used in the vocational class to the Tutorial Support session. Students can then practise briefly responding to class discussion questions. These responses can be audio taped to facilitate giving feedback.

Here is a discussion question from a Welfare class:

> *You are a welfare worker employed in a neighbourhood centre. A woman with two young children approaches the centre about leaving her husband and you have referred her to a women's refuge. Later in the day her husband comes to the centre demanding to know whether his wife has approached the agency.*
>
> *What would you do in this situation?*
>
> *What problems does it pose for you as a worker?*

Teacher feedback can include grammar, vocabulary and register as well as pronunciation. The teacher can also give a lay person's opinion as to whether it seems that the student has addressed the appropriate welfare issues or not. (The welfare issue in this situation is confidentiality.)

Strategy - Audio/videotaping real life discussion or role play

This activity can be done as homework, or in class, when individual responses to discussion questions, or pair/small group/role play discussions can be recorded. The audio tape can then be replayed and the participants given peer and teacher feedback on how clearly they have put their ideas or viewpoints across and how appropriately they are addressing the task at hand. Below is a discussion question from a Welfare course followed by transcripts of two NESB students' responses.

> *A 35 year old woman, separated from her husband, tells you that she has misled the Department of Social Security regarding her present status. She is presently receiving the Supporting Parents Benefit, claiming three dependants despite the fact that her eldest child left home two months ago. She is also working as a waitress, part-time, to supplement her income. You work for an agency whose stated policy is to report breaches of the Social Security Act, but you decide to take no action.*

The students had to state whether they agreed or disagreed with the worker's decision as described in the question, and to justify their opinion.

A number of responses were recorded, replayed and considered individually.

Student 1—transcript of response:

> *'As a welfare worker, I agree with this woman because we have to support this woman. She has a lot of problem and then I will ring to the Social Security talking about what happened with Social Security about this woman.'*

Feedback:

- To watch references: *this woman* is used to mean both the worker and the client.
- Minor details: ring *to, the* Social Security and so on.

Student 2—transcript of response:

> *'Well I will choose the middle line. First I disagree for the act of the agency to report breach of Social Security because is interfere with the confidence of the client is confide on you. And also I understand how difficult for a mother with two or three children, doesn't matter, to live on Social Security. She maybe want to give something the best for her children and you can't really with living out of Social Security. But coming down ... (with) really it will be a policy of the agency I am working for and anyway I will be compelled by law to report her but would be against my own feeling, about my own ideal ... working in an agency to help people it seems to me I would betray that person.'*

Feedback:

- In this student's case pronunciation features played a significant role in making it difficult for others to understand her.
- /h/ and /u/ sounds, plus rhythm seem to be the main issues.
- If she concentrated on speaking more slowly, the others would find it significantly easier to understand her.
- Minor details - phrasal verbs (e.g. confide *in*, live *on*), use of *would* rather than *will* for a hypothetical situation.

Students who have not audio-taped themselves before are often surprised to hear how they sound on tape. This type of exercise is also useful for peer feedback on what is difficult and what is easy for the others to understand.

Asking questions in class

Strategies in this section were contributed by Marianne Wagner with Fran Jelley sharing a strategy she uses with Hospitality students.

Being able to confidently and competently ask questions in class is an important learning-to-learn skill. In our culture, if students do not understand, they are expected to take some responsibility by asking questions of the teacher. Some students however lack the confidence and/or the language competence to ask questions. Others may be constrained by cultural factors.

Strategy - Demonstration and modelling

If the support teacher is present in a team reaching role in the vocational classroom he/she can demonstrate interrupting, turn taking and questioning for the students. This can be done very naturally especially when the ESOL or ABE teacher is still unfamiliar with the vocational area. Generally the students become increasingly vocal after the first few weeks, particularly if the vocational teacher is actively encouraging their questions.

Strategy - Role play with audio taped class sessions

A team-teaching approach may not be possible in the Tutorial Support situation. However, if audio tapes of teacher presentations from relevant vocational classes are available, they can be used to help students practise pin-pointing moments when they would like to ask questions, and more importantly, how they would formulate such questions.

Rather than saying, 'Could you repeat that please? or, 'I didn't really understand,' the Tutorial Support teacher can try to get students to be as

specific as possible in their questions, for example:

'What did you mean by XYZ?'

'So if you do XYZ, what happens?'

'I think you said XYZ - is that right?'

'I feel fairly clear about ABC, but can you tell me more about XYZ?'

Strategy - Role play and demonstration with class notes and textbooks

If audio tapes of vocational classes are not available, the Tutorial Support teacher can demonstrate interrupting and questioning by orally presenting vocational material drawn from class notes, a textbook or another suitable source. It is also very useful for students to practise interrupting each other and asking for clarification as necessary. For example, you can make an audio tape of a student discussion and then review how appropriately turn taking, interrupting and questioning for clarification occurred.

Strategy - Role play with student reconstruction of text

Although the above activities focus on listening as well as speaking, the following is an activity that focuses more heavily on listening. Fran Jelley uses the following activity with NESB students in Hospitality courses. As well as being a listening activity it is also a strategy for checking students' understanding of spoken technical language.

Ask students to write down your exact spoken words.

Deliver instructions or a short spoken text in a realistic voice, for example:

'Get the big bowl.'

'Wash your hands first.'

'Use a clean pan.'

'Close the box.'

'Wipe the table.'

Students repeat the instructions from their written notes.

Check their notes for signs of phonological difficulties such as omitted words, for example, *your* and *the* or inaccurate substitution, such as *ball* for *bowl*, *pen* for *pan*, *books* for *box*, *in the street* for *industry* and so on.

For further listening strategies see *Notetaking from a spoken text* in the following section.

Notetaking

Strategies in this section were contributed by Marianne Wagner, Michael Callaghan and Kathy Salter.

Introduction

Notetaking involves selecting and recording the main points of a lecture, oral presentation or written text. Although the end product of notetaking could be seen as a summary, for the purpose of this book 'summarising' is defined as the process of producing a concise text that is organised for a particular purpose, for example: studying for exams, planning an essay or as a reference for carrying out a particular task. Notes taken in class or from textbooks are just one resource that students can use when going through the process of organising information into summaries. Notetaking activities comprise Stage One of the teaching model described earlier.

Notetaking from a spoken text

Students should have a clear purpose for notetaking. It could be to record information that may become research material for assignments or to produce a resource for constructing summaries for study purposes. Although the main focus of these activities is notetaking, listening skills are also being developed.

Strategy - Audio recording

With an audio tape of the vocational teacher's classroom presentation, a long discourse can be dealt with in sections giving time for:

- demonstrations of notetaking by the teacher;
- repeated listening;
- joint construction of notes; and
- discussion and analysis of models produced by students and teacher.

Audio recordings of the vocational teacher's explanations and examples can also be very useful in assisting students to add to their notes and to understand the relevant concepts. This technique has been found useful in subjects like law, where concise definitions followed by examples and applications are common. Practice should include listening for key ideas as well as listening for detail.

Strategy - Demonstration

If the ESOL or ABE teacher has the opportunity to sit in on the vocational class or team teach, he/she can record notes on overhead transparencies and show the notes to students. From these demonstrations students can learn the process of notetaking but more importantly the notes provide models of the tricks and techniques of more experienced notetakers, such as telegraphic style writing, personal and standard abbreviations, headings and point form. These notes can also supplement the students' notes and be used later to clarify areas of uncertainty or check vocabulary items. The teacher can later demonstrate how these rough notes can be organised by grouping information into summaries (see *Organising Information*).

Notetaking from written texts

As well as the purposes mentioned above, notetaking from written texts can provide a means for improving students' understanding of theoretical content. Notetaking from written sources is also an important part of the research stage for essay, report writing and short answer style assignments.

In order for students to be competent at notetaking from written texts, they need to develop skill in skimming and scanning.

Skimming – What's this book/text about?

Skimming for notetaking can help the reader:

- obtain the gist of a particular chapter or section; and
- find out whether or not a particular book or text will be useful for an assignment or other purpose.

Strategy - Skimming activities

Strategies for skimming include:

- looking over the table of contents;
- looking at headings and subheadings; and
- finding the sentences that carry the main ideas of a text.

In order to help students find key sentences you will have to become familiar with the text types that the students are using. For example in a newspaper article, the main ideas are usually contained within the first and sometimes second paragraphs. The rest is an elaboration of these points. In other text types, one needs to skim the first sentence of each paragraph to get an idea

of what the whole text is about. There are no rules – they will vary with the text type and the style of the author. The more you study these patterns and explicitly share this knowledge with your students the more competent they will become at finding patterns independently.

Scanning – I'm looking for 'x'.

Scanning helps the reader:

- extract the key concepts or main ideas of a text;
- locate parts of a text that answer specific questions or address particular issues; and
- read for detail.

Strategy - Extracting main ideas

This strategy is based on an activity from McEvedy and Smith (1990) for 'identifying the general idea of a text'. It has been used successfully with Adult Basic Education students having difficulty skimming, scanning and notetaking.

Firstly students need to identify the content words or lexical items (nouns, verbs, adjectives, adverbs and so on) in a text. The task should be done as a joint exercise by teacher and students until students become competent at identifying these words and constructing a summary sentence independently. The procedure is as follows:

1. Read a paragraph or part of a text where you need to identify the main idea.
2. Underline or highlight the content words.
3. Do a word tally (synonyms can be classified as the same word).
4. Select the most frequently occurring words.
5. Use these words to construct a sentence that encompasses the main idea.

This technique is time consuming. However students who engage with it and practise it soon find that they no longer need to underline the words or do a word tally but can skim and scan to find the main ideas. This strategy seems to help some students develop the technique of reading for detail. Do not persevere with this strategy however, if students do not engage with it after two to three joint attempts.

Finding grammatical clues

If students are scanning for a particular purpose or for particular information then instead of looking for words that frequently appear in the text, they can be taught to look for categories of words that signal the purpose of a section or whole text.

A knowledge of the grammatical features of the text types found in the written texts used in their course can help students develop skill in scanning. Such knowledge can also be useful for developing a student's competence in writing the specialised types of texts required of them in their course or workplace.

In order to use the following activities effectively you will need to become familiar with the genres found in the students' texts, their grammatical features and typical structures. You will also need to prepare for the following activities by analysing sample texts with the students beforehand.*

Strategy - Cloze

Provide students with passages where words that signal a particular genre are deleted, for example conjunctions in an explanation. Discuss with students the function these words perform in the text. Have students identify other words from that class (conjunctions) that frequently appear in their textbooks and course notes. You might draw up a list of these subject specific words.

Remember that you are teaching the students about the kinds of words that are the key words in a particular text type. That is what guides you in your selection of deletions for this activity and what focuses the post activity discussion with the students.

Strategy - Predicting

When students have become familiar with a certain text type have them predict which words are likely to be in a text and then have them quickly scan the text to verify their predictions. Discuss how they did this and what effect it had on their understanding.

Organising Information

The strategies described in this section help students organise, categorise and classify information in the ways of their specialised field of learning. Classification activities are one of the most effective ways that a teacher can check a student's understanding of particular concepts.

* For a more detailed account of how Functional Grammar and Genre Theory can be applied to Tutorial Support read Cristina Murru's book, *EVP in Accounting–Strategies for ESOL teachers*, (1995).

Remember that students must have some understanding of theoretical concepts and terminology before engaging in these activities. These activities however, can help to deepen and clarify understandings.

Sequencing

Carol Hayes, Kathy Salter and Judith Partlin describe strategies they use with ABE students in trade courses. Fran Jelley describes a strategy used with NESB students in hospitality courses.

Sequencing applies to any procedure that must be done in a particular order. In a variety of vocational courses students are required to decide on the order of events and write a description of this order of events. In some courses students need to sequence information when planning the writing of essays and reports.

If a student is having difficulty writing down the sequence of steps in a procedure that they perform in practical classes, check with the vocational teacher that she/he can perform these steps in the correct sequence in class. If so, then look at how the teacher or the course notes describe the procedure. Is each activity described or are activities grouped under categories? If the answer expected involves a mixture of categories and single activities, this may well be the source of the student's confusion. For example Panelbeating students may be expected to detail the steps in the welding stage of a process but not the steps in preparation and finishing. Being explicit about what is wanted can often help the student.

Another common problem is that students forget activities or stages when writing a procedure because they think that a certain activity is so obvious it does not need to be included. This often happens with the initial or preparatory stages of Panelbeating procedures, for example *inspect the damage.*

The following activities can help students order the steps or activities in a procedure and sort out the parameters of different stages in a procedure.

Strategy - Brainstorm, write, sort, check

1. Talk about the procedure and the steps involved. If possible, do this whilst carrying out the procedure.
2. Brainstorm the steps in the procedure.
3. Write the steps in any order on cards.
4. Sort the cards into the correct sequence.
5. Check to make sure that the sequence matches up with the text by reading the procedure.

Actively involve the students by asking them to reflect on and recall what they are doing as they work through the procedure.

Strategy - Brainstorm, group, write, sort, check

Sometimes students are required to list stages in a procedure where each stage involves more than one step or activity. For example in Panelbeating students can be asked to list the five stages in the procedure for carrying out a sectional repair. The stages are:

1. Measuring and marking
2. Cutting
3. Joining
4. Welding
5. Finishing

While brainstorming the steps or activities, help students group them under the above stages and discuss the parameters for each stage. On each card students write the stage as a main heading with the activities listed as subheadings, for example:

FINISHING

trial fitting

filling

complete assembly

dismantle for painting

reassemble

The cards are then shuffled, sorted into the correct sequence and checked.

Variation 1

If students are having difficulty differentiating between stages and steps or activities in a procedure get them to write the stage on one side of a card and the activities on the underside. Students then shuffle the cards and try to recall what is on the underside before turning over to check. They can then arrange either the stages or activities in the correct sequence.

Strategy - Working out a work sequence and time frame

The following strategy encompasses all stages of the teaching model. The focus is on enhancing students' listening and speaking skills, as well as their sequencing skills. Students are also practising strategies that will enable them to independently complete a particular assessment task. The method has applications in a wide range of trade areas and also in modules related to time management.

Introduction

In some hospitality courses students have to reproduce the spoken instructions of the classroom and record them in the form of a list, for example:

Collect utensils

Wash vegetables

Chop carrots, julienne style

They also have to:

sequence activities

write instructions

use appropriate vocabulary

estimate time to complete each task and

estimate time to complete the whole procedure.

You need to analyse the tasks involved before starting a sequencing activity.

For example a student studying the Module–*Food Preparation Skills: Meat, Fish and Poultry* in a Hospitality course, has to prepare and present the following:

- 1 fried fillet of fish accompanied by suitable amount of mayonnaise from a full quantity of mayonnaise made in class
- A suitable garnish, selected according to the teacher's guidelines to be presented with the fish and mayonnaise
- 1 small (3 cutlet) rack of lamb with a glaze, selected by the teacher and a suitable garnish.*

Each student is required to write and bring to class two copies of a time plan to work to in class, plus costing and ingredients for twenty serves. The dishes must be presented 40 minutes before class completion. As well as working

* Food Preparation Skills: Meat fish and Poultry—Student Work Manual, Tourism & Hospitality, TAFE NSW.

out a sequence for preparing this menu, students need to understand the time frames for the activity.

Procedure

As a warm-up activity, ask students to describe a familiar everyday procedure, for example leaving the house or flat.

Write the tasks they perform on the board or overhead projector using imperative form, for example:

Close windows

Put the dog out

Leave a note for ...

Lock the back door

Check ...

Use coloured pens to number the order used by different students.

Emphasise the variety of possible sequences and any impossible sequences.

The teacher then prepares a number of cards, some of which are blank and some of which contain more predictable instructions or prompts such as;

Wash hands

Turn on oven at temperature required

Set the table

Wash and cut vegetables

Remove food from oven

Serve

Wash up (x 3)

Allow food to cool

1. Discuss with students the use of the imperative form of the verbs or processes and note their position in each instruction.
2. Working in pairs one student must tell the other student what has to be done in any order using the imperative form as above.
3. The other student writes down each missing activity on a blank card.
4. The students discuss how long each task will take and note the time in brackets on each card.
5. The students then sort the cards into a suitable order.

6. The teacher supplies butcher's paper, with a commencement time written at the top and completion time written at the bottom.
7. The students lay out the cards in the chosen order and check that the times they have estimated will fit into the time frame.
8. The times are added at the side.
9. The students transcribe the solution onto paper including the timeline.

Note: This task may reveal numeracy difficulties that need attention.

This method will result in each pair having an identical time plan. The teacher needs to negotiate with the vocational teacher to get approval for this in the first or early weeks of the course. Subsequent timelines can be constructed in the same way, but independently.

Strategy - Writing process descriptions

Introduction

While written instructions are generally in imperative form, for example *Rake the soil*, descriptions of procedures and processes are often written in passive voice*. Students may be required to read or write such descriptions of processes. For example, hospitality students might be asked to describe how cheese is made and to include a flow chart, or science students may need to work out a procedure from a process description such as that shown in Figure 3.

Figure 3

Sample Frequency

The frequency of sampling must be sufficient to show expected variations in concentration, and show results which may have statistical significance.

Sampling Methods

Air **can be sampled** in suitable containers which **are** later **carried** to the laboratory, or the air **can be** immediately **introduced** into the analytical instrument. The pollutant **can be enriched** by adsorption on solid surfaces or by absorption, for example, into filter paper or liquids.

In most cases the volume of the air sample **must be measured** during sampling, for which the air pressure temperature and air flow rate is frequently necessary.

The air pressure **must** also **be known** when the results **are to be referred** to $1m^3$ because of the higher demands on the accuracy.

In principle, a representative air sample **must be taken** at a site surrounded by flat terrain without trees or walls and without precipitation.

NSW TAFE School of Applied Science Assoc. Dip. Health and Building. Lab. Notes-Pollution and Waste Disposal 2. p 26.

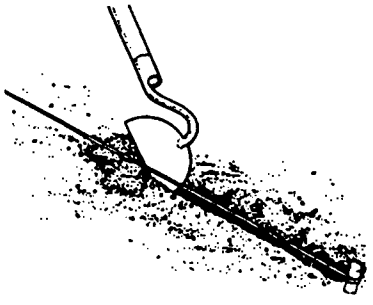
* For a description of active, passive, middle (intransitive) and imperative forms see Collerson, J. 1994 pp 49-53 and Eggins, S. 1994 pp 185-186, 229-231.

Procedure

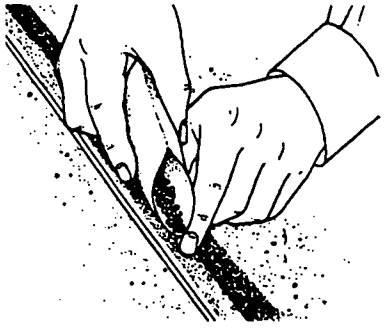
1. Using a familiar process from the course content, draw up or copy a series of images that represent the steps or stages in the process.
2. Paste the images onto a flow chart with space near each image for written text (see figure 4).

Figure 4: Direct sowing into garden beds

1



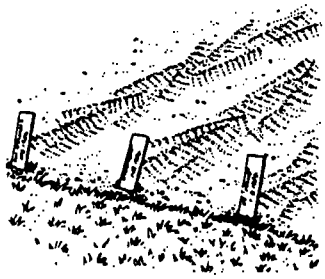
2



3

4

5



6

NSW TAFE. Horticulture Trade Stage 1, Student Course Notes – Propagation of Plants. pp 29–32.

3. Demonstrate how the passive is formed* and then jointly construct one or two steps in the procedure.

4. Students then complete the descriptions either in groups or independently. Students may need to practise several procedures before being competent in writing them independently.

* For a simple explanation of how the passive is formed see Collerson, J. 1994 pp 52–53.

Whilst engaging in this activity, discuss with students why someone would choose this structure over other forms such as imperative mood and active or passive voice. Discuss the appropriate contexts and purposes for each form. In future exercises, ask students what they think is the most appropriate form before they begin writing a description or procedure. Do not forget, however, to show students how different forms can be combined in the one sentence, for example compare:

Cover the seeds by raking back the piles of soil at the sides of the drill to fill it in. with *The seeds are covered by raking back the piles of soil at the sides of the drill to fill it in.*

Semantic or mind maps

The Combined cloze/Semantic map strategy was provided by Caroline Kane. The remaining activities were provided by Kathy Salter.

> *Semantic mapping ... is an instructional strategy designed to promote vocabulary and concept formation. The technique takes many forms, but the essence is to draw out students on a topic and then guide them to cluster or organise their thoughts (in the ways expected in their field of study). The strategy can help students make contact with prior experience, analyse the content of a text or prepare (their own written/spoken texts)."* (Calfee & Nelson-Barber, 1991. p 54)

A semantic or mind map can help students see relationships between concepts that were not obvious to them during classroom talk or reading of course notes. Their understandings may consist of isolated bits of information which they need to group into more meaningful chunks to deepen understanding and to aid recall.

Remember to follow up the strategies and activities below with study suggestions. Explicitly show students how they can use diagrams, flow charts, tables and so on for study purposes and how these summaries can be used to construct revision questions, or prepare essays or reports.

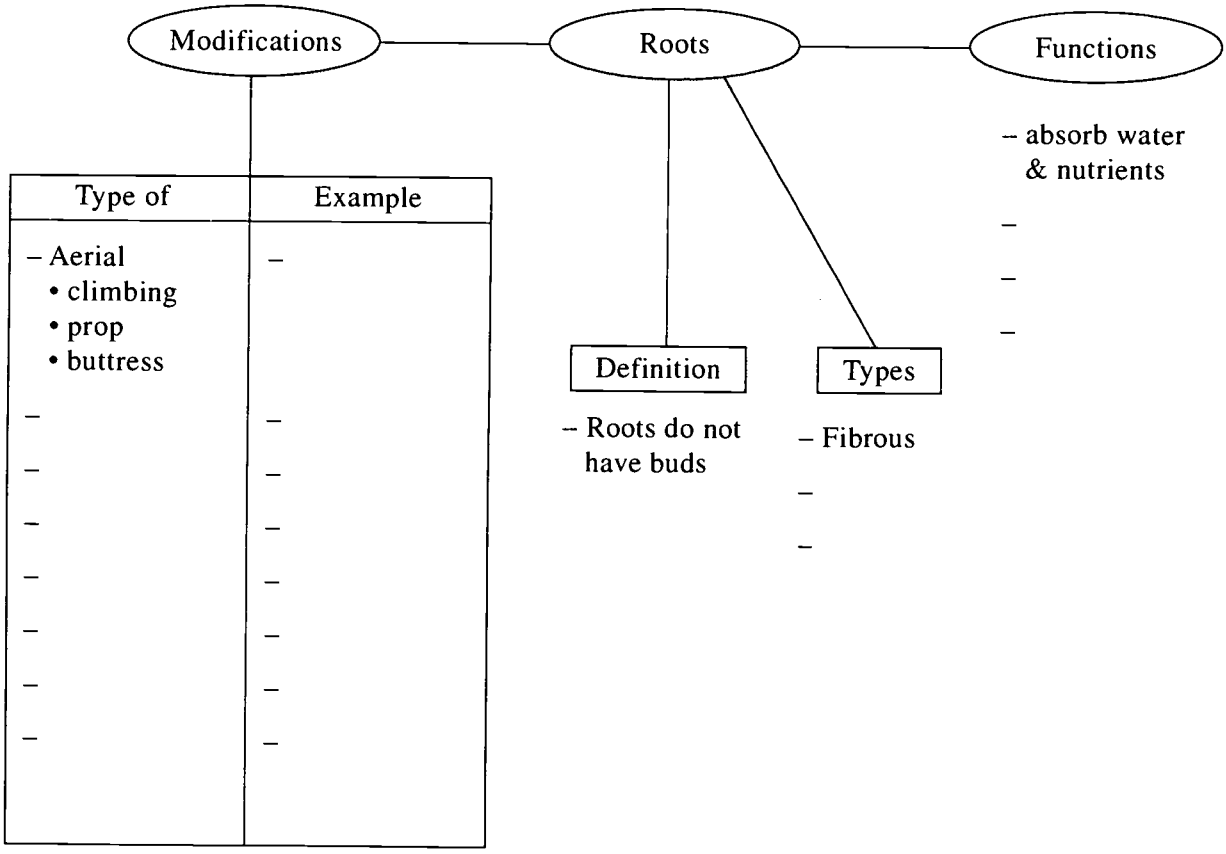
Strategy - Guided semantic map

1. Take a topic that the students have done in class.
2. Find out from the vocational teacher and course notes, how information is categorised for this topic and what students will be expected to know for assessment tasks. For example, students in various Horticulture Trade courses study the main parts of a plant and then look in more detail at each part (roots, stems, leaves and so on). For plant roots, they are expected to be able to:

- define the term 'root';
- name the different types of roots;
- describe the functions of a root; and
- list different root modifications and give examples.

3. With this information draw up an incomplete semantic map.
4. Students then complete this map by brainstorming, discussing and writing down what goes into each category. Later, students can be encouraged to draw up a map themselves by using headings from their course or class notes.

Figure 5: Guided semantic map



5. Discuss with students how they might use this map for studying, for example you could jointly construct study questions from the map such as:
   - List four types of leaf modifications and give an example of each.
   - Describe four functions of a plant root.

Many students find it much easier to construct questions from a diagram such as figure 5 than from large blocks of text in course notes and textbooks.

Variation 1

This activity focuses on giving students practise in scanning their course notes for information.

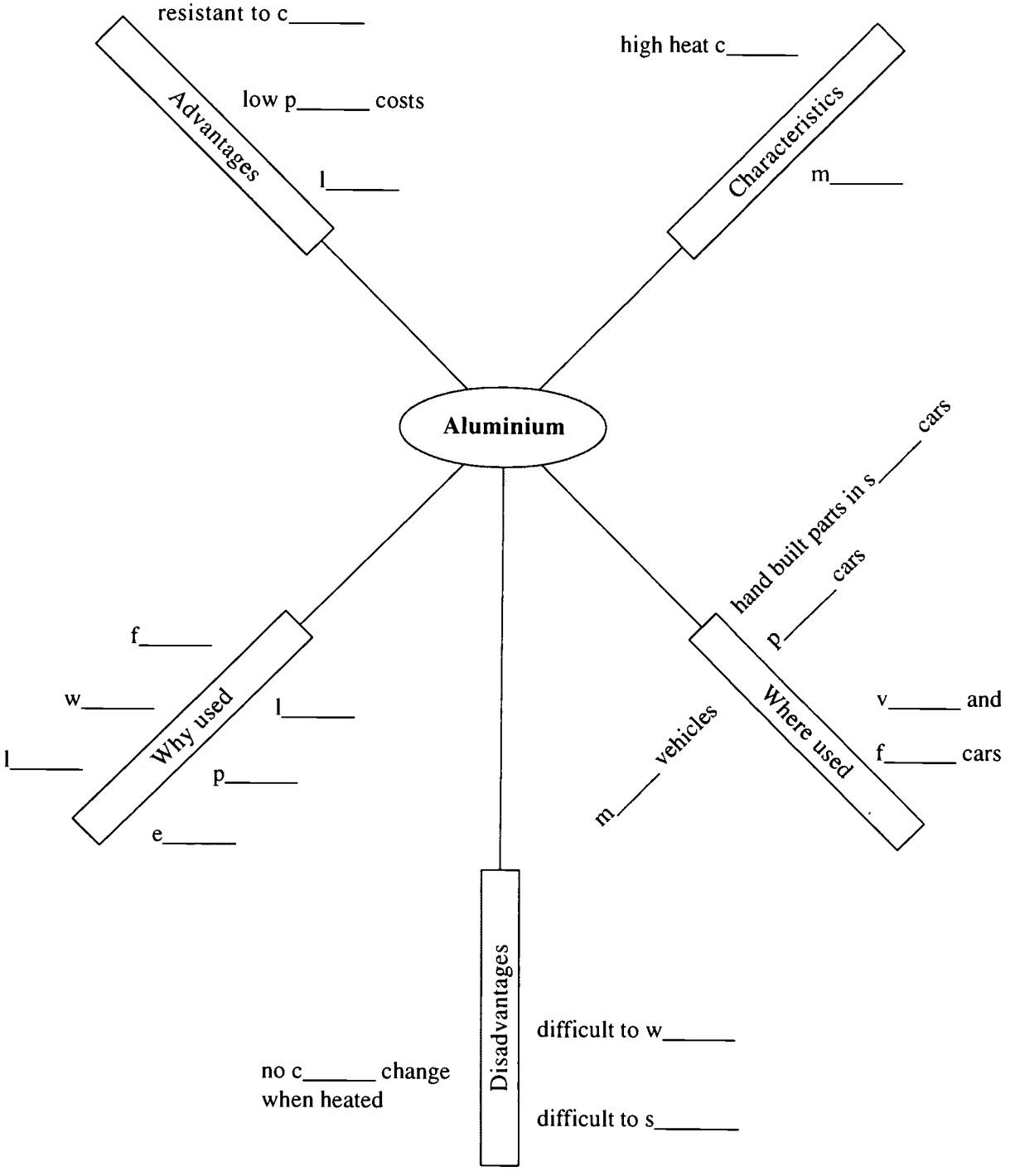
Instead of brainstorming or discussing what might fit under each category, get students to scan their course notes for the relevant information, then compare and discuss their answers.

Strategy - Combined cloze/Semantic map

This is a revision activity (Stage Three of the teaching model) where students can practice recalling information and writing or spelling technical terminology. If preceded by group discussion it could also help students understand and organise information (Stages One and Two of the teaching model).

1. For a particular topic, identify the categories that the students need to organise information under. For example in the topic *Aluminium* in Stage 1 Panelbeating, students need to know the characteristics of the metal, where it is used on vehicles, why it is used and its advantages and disadvantages.
2. Put each of the categories on a semantic map.
3. You may put the first letter of each item around the main categories to aid the student.
4. Students write the relevant terms or phrases around each of the main categories. A list of answers could be provided at the bottom of the page or on a separate page to assist students further or enable them to check their answers and spelling.

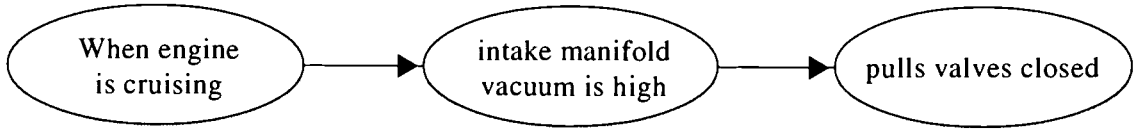
Figure 6: Combined cloze/Semantic map



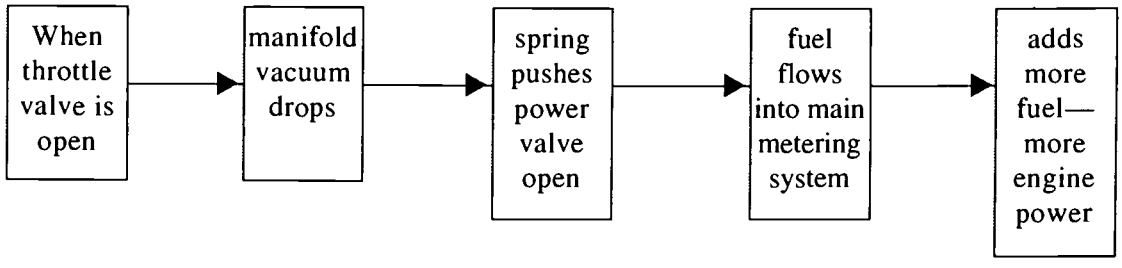
Flow charts and tree diagrams

Flow charts are best used for processes and procedures and for showing cause and effect relationships. For example, the following flow chart shows a process in the Automotive Engineering Trade.

Figure 7: Flowchart–Power valve action



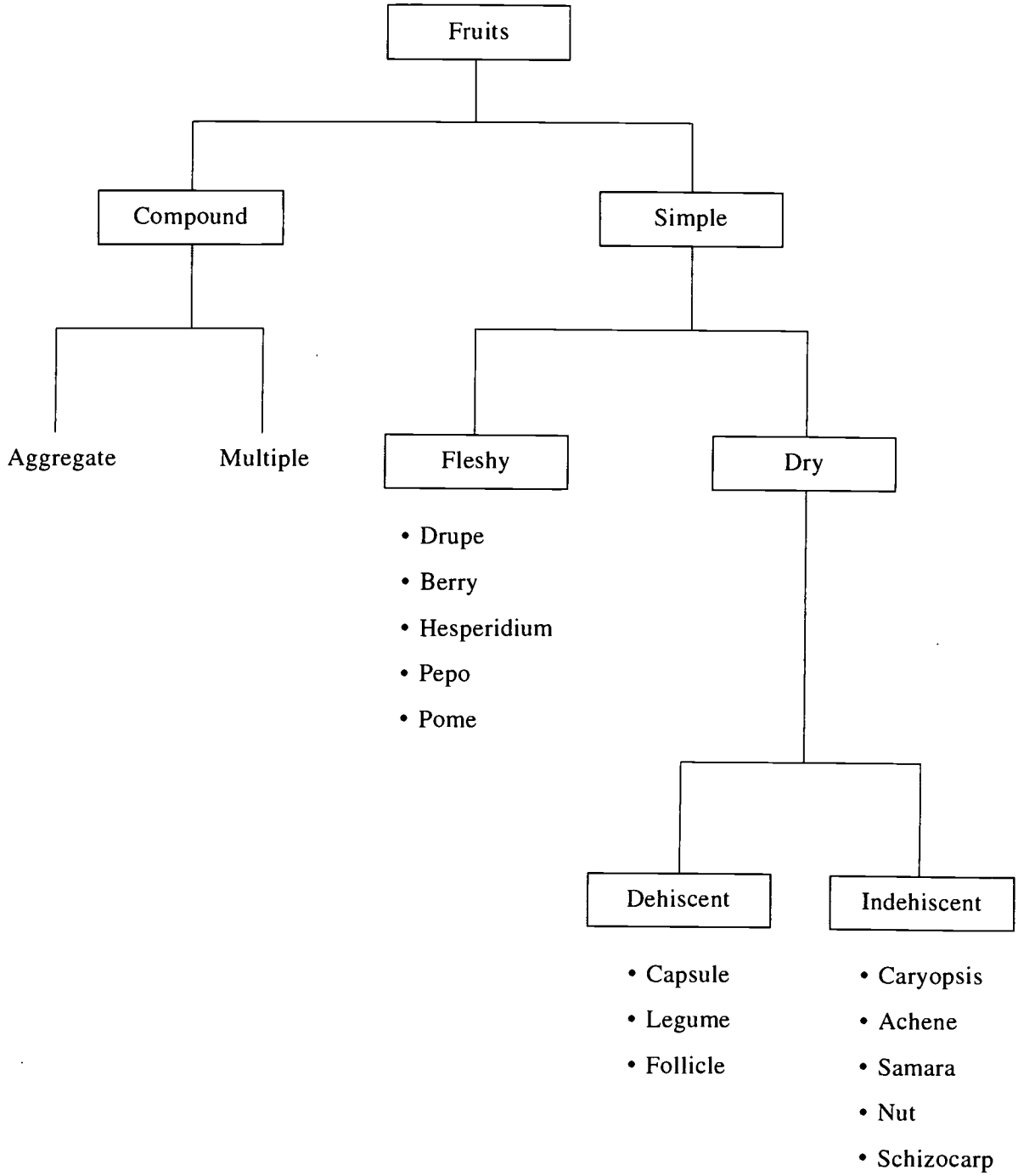
or



Tree diagrams show relationships between categories and subcategories. Whilst they are most commonly used in the sciences for classifying (see Figure 8 below) they can be used in many other areas, for example to show the structures of organisations (Business and Office Practice courses) or the relationships between 'mother sauces' and their derivatives (Hospitality courses).

Flow charts and tree diagrams can be used in the strategies described under *Sequencing* and *Semantic Mapping* above.

Figure 8: Tree diagram



Tables

Tables are particularly useful when information needs to be categorised under more than one criterion.

Figure 9: Table

Hairdressing Science	Topic 10: Nutrition and Digestion		Study sheet
Nutrient	Function	Examples	Found in
Carbohydrates			
Fats and Oils			
Proteins			
Minerals			
Vitamins			
Liquids			

Tables can be used directly for memorising, by covering rows or columns with a cover sheet and leaving headings visible. Students then fill in the table on the cover sheet.

Engaging with Written Text in Trade Courses

In this section Carol Hayes describes a Whole Language approach used with Trade Certificate students in Competency Based Training courses.

Introduction

There is now a National broad-based curriculum that divides Metal and Engineering Trades into competency based modules of work. Students have to complete each module of work to a desired competence.

There are also underpinning areas of competence such as comprehending spoken and written instructions, problem solving, producing written text and answering questions.

As a Tutorial Support teacher you may be working with students enrolled in the National Metal and Engineering Courses which include:

Electrical Trades

Metal Fabrication—Welding, Sheetmetal and Boilermaking

Fitting and Machining

The strategies outlined below can be adapted to help students in other vocational courses in TAFE especially those courses with detailed learning guides including self-paced materials. The move toward flexible delivery has resulted in an increase in learning from print based texts.

What kind of tasks will these students have to do?

Most of the written texts used in competency based training are instructional texts. Students have to follow a set of instructions to carry out a task or to learn a particular procedure. They also have to describe, explain, sequence and classify information. To do this they will need to develop English language, literacy and numeracy competence.

What type of texts will they have to read and understand?

instructions
diagrams
pictures
exam/review questions
brochures
technical publications
board notes
glossaries
procedures
charts
tables
magazines
teachers' notes
textbooks
maps
dictionaries
workshop manuals

Many students who are enrolled in TAFE courses do not have the strategies to organise and categorise written information in a logical and meaningful way. This affects their ability to learn the information for an exam or competency test. Most students think that all they have to do is re-read information and it will 'stick in their brain.'

But re-reading is not memorising.

Memorising needs to be an active process. You need to talk through (reconstruct), think, visualise and organise information in a way that is meaningful before you can memorise it.

Students need to develop strategies to:

- talk confidently about the topic using the terminology associated with their trade;
- skim, scan and read for detail;
- interpret diagrams, flow charts and tables;
- make connections in the text with knowledge they already have;
- write a brief summary or answer to a question;
- draw diagrams and flow charts to explain the topic; and
- formulate questions about a topic.

Strategy - Predicting

Students can predict information about the topic before reading the text. Ask questions which allow students to predict. Write up the predictions and get students to expand on their predictions with further questions.

Strategy - Retelling

Retelling enables the teacher to find out whether or not students understand the topic by expressing it in their own words (the language used on the job or in the workshop).

It enables students to organise their thoughts and knowledge in systematic ways. By retelling, students develop control over text structure, vocabulary and concepts. Retelling forces the learner to predict and then to compare their version with the written text.

Following are activities that you can use with a particular piece of text to help the student interpret, understand and learn the information.

- Read the text (student or teacher); then ask what the student understands about the text and any illustration or other graphic.

- Read the text and ask the student to retell it in writing.
- Student reads the text and retells* it orally.
- Student reads the text and retells* it in writing.
- Read and talk about the text; then student recalls it by drawing diagrams, flow charts, tables and so on.
- Student reads the text, and interprets it by drawing diagrams, flow charts, tables and so on.
- Student explains (interprets orally) diagrams, flow charts and so on.

Ask lots of questions about the information in the text as you and the student talk, read and write.

Write down the questions that you or the student asks.

Write down the student's answers.

Use the answers to make connections with other information in the text.

Always check with the vocational teacher that the answers to the questions are accurate.

The questions and answers that have been produced along the way can now form a set of study sheets which students use for revision. Old exam questions and assessment tasks also make useful study questions. Turn the multiple choice questions into what, when, where, why and how questions.

***Note:** The choice of retelling will depend on the student's oral and written language skills.

Extracting Meaning from Written Text

Marianne Wagner describes strategies she uses with NESB students in Advanced Certificate and Diploma courses .

Much has been written elsewhere about the importance of pre reading activities in helping students comprehend written text. It is important that students, through discussion, explore their knowledge of a topic before reading a text about it. Understanding the schematic structure of the text they are about to read will aid their understanding as will reading-for-meaning strategies such as stopping between chunks of text and annotating a text as they read. As well as the strategies below, strategies in the section *Notetaking from written texts* (pages 37-39) help students to extract meaning from text.

Strategy - Focus on grammar and vocabulary

Students need to develop skills in reading for detail when appropriate. Focus on aspects of grammar and vocabulary by asking questions as illustrated in the following example, taken from *The New Diary* by Tristine Rainer.

> *Don't feel that you have to write when you don't want to or haven't the time.(1) The diary allows you to make excellent use of time when you have it. It makes no demands when you haven't time for it. As it is in poetry, silence is part of the form.(2) ... The silence in diaries can speak as eloquently as the words.(3) ... The life of a recluse can make a fascinating diary, while the diary of a celebrity can be superficial and dull.(4) Therefore, don't judge your writing, just trust your process.(5)*
>
> (Rainer, 1990)

1. What may you not want to do, or not have the time to do?
2. What does 'it' stand for in these three cases?
3. What two things are being compared?
4. What two things are being contrasted?
5. What is the reason given for this suggestion?

Other types of questions focus on synonyms or antonyms. For example, it is important that law students realise that 'legislation', 'statutes' and 'acts' all mean the same thing in the legal context and may be used interchangeably in the same paragraph. Sometimes it is important for students to know what relationship exists between words. For example, in law, a 'clause' is a part of a 'contract'.

Using questions that relate to grammar and vocabulary can help students get to the meaning of the particular text, while at the same time giving them skills which they can apply to other texts in the future. In other words, they are not just learning to read one text, but are learning reading skills that are transferable from text to text and across genres (Intertextuality).

Strategy - Focus on meaning

Assisting students to identify and extract key ideas in more detail is a necessary part of taking notes from written texts. Students should have a specific purpose in mind before reading for detail. Ask questions that will assist them to scan, identify and extract information.

For example, students in a Welfare class were asked to read the following chapter from *Social Sciences in Australia* by Chilla Bulbeck.

> *Egalitarianism is not the same as equality. Equality means that everyone is equally placed, receives the same rewards from society, or at least the same rewards as anyone in a similar situation. A watered-down version of equality is the notion of equality of opportunity, that everyone has the same chance to succeed. In Australia the idea of equality of opportunity is captured in the colloquial phrases 'fair suck of the sauce bottle', 'fair go' and 'fair crack of the whip'. Egalitarianism relates not so much to individual outcomes as to evaluations of other people. It derives from the Kantian notion (Immanuel Kant [1724-1804] was a German philosopher) of the common worth of individuals. This is expressed politically in the notion of equal political rights – the vote, equality before the law and so on. Australian egalitarianism refers to 'a concept of the essential humanity of all men' (Horne, 1964: 34) or at least all men who are ready to conform – not too smart, not too non-European in looks and practices, not too pushy or arrogant.*
>
> (Bulbeck, 1993. p 73)

To give purpose to their reading the Tutorial Support teacher asked the students to scan two pages for a paragraph where egalitarianism and equality were defined, and then to make brief notes on Bulbeck's definitions of 'egalitarianism', 'equality' and 'equality' of opportunity.

The Tutorial Support teacher asked questions to assist the students to scan and identify relevant information. They jointly came up with the following summary:

equality = same individual outcomes

equality of opportunity = same chance to succeed

egalitarianism = equal rights (Bulbeck beginning here to explore her ideas about Australian egalitarianism being limited to white males conforming to a certain ethos)

Understanding and Answering Written Questions

Carol Hayes describes strategies used with Trade Certificate students.

Introduction

In technology/trade courses students need to learn how to deal with the following types of exam questions:

- multiple choice
- cloze
- short answers
- calculations
- completing tables, diagrams, charts
- labelling
- true/false
- matching information

Students need lots of practice reading questions, interpreting them and writing the answers. Through modelling, demonstration and discussion of texts, students begin to make a link between information and the kinds of questions that attempt to elicit that information from them.

To become competent in understanding assessment questions many students need practice in answering plain English versions of questions before introducing them to ways that information is sought in formal assessments. For more experienced learners this may only be needed early in the course. For others, assistance such as 'plain Englishing' of exam papers may be needed until they build up confidence and competence in answering authentic questions.

When students are introduced to authentic assessment and exam questions they not only need to practise interpreting them but more importantly, need feedback on their interpretations. They need to spend time with someone sharing their interpretations and jointly constructing the meanings. The collaboration of the vocational teacher is needed here because, for the student, understanding questions involves a process of acquiring understandings in a specialised social, cultural and technological context.

Remember that the students' responses to questions are a window into how they are interpreting and thinking. Exam questions can be difficult to interpret at times and teaching students grammatical analysis or exam terminology in isolation does not work.

Strategy - Role play

Role play by taking turns to ask questions.

1. Begin by demonstrating the process and asking the questions. The answer to one question should generate another question which forces the student to go back to the text for confirmation.
2. Then the student asks you the questions.
3. Always write the questions as you go.

Here is an example of a piece of text which students have to deal with in stage 1 of Electrical Trades:

> As the flux expands from the centre it cuts the conductor. When the current stops flowing, the field collapses, again cutting the conductor. Because a moving magnetic field induces a voltage in a conductor, there must be a voltage induced in the very conductor producing the magnetic field in the first place.
>
> Lenz's Law says that this voltage will oppose the current producing the magnetic field. In other words, the act of the current starting to flow is itself opposed. This opposition is called inductance.
>
> The same thing happens when the current is switched off. Here the magnetic field around the conductor collapses, inducing an EMF that will try to maintain the original current. Because the induced EMF opposes the current, it's often called a back EMF.
>
> Therefore, inductance is a property that opposes a change in current. Inductance is present to some extent in all components–even conductors.
>
> (Phillips, 1994. p 84)

Using the text above the following questions could be generated:

Q. What happens to the flux when it cuts the conductor?

A. It expands.

Q. What does expand mean?

A. It gets bigger.

Q. What gets bigger?

A. The flux.

Q. What causes the flux to expand?

A. The current starts to flow.

Q. What happens if the current stops flowing?

A. The field collapses and cuts the conductor again.

Q. What does Lenz's Law say?

A. It says that a voltage will oppose the current.

Q. What is this called?

A. Inductance.

Talking about what students know and showing them how to question and find information will build up confidence which leads to less anxiety when it comes to exams and tests.

Strategy - Turning headings into questions

1. Take a heading from a text and demonstrate how to turn it into a question.
2. Ask the student to turn the next heading into a question.
3. Student skims text to find the answer.
4. Highlight key words and information in the text that supports the answer.
5. Make up questions from a list of key words.
6. Expand answers to make up new questions (connecting known with the unknown).

Module objectives can also be used for this purpose.

Following are examples of this strategy using extracts from trade texts.

Advantages

Requires much less heat input and causes less distortion than fusion welding. Braze welding is able to join a wide range of dissimilar metals including non-ferrous, eg copper to steel.

Disadvantages

Higher consumable costs.

Loss of strength at moderately high temperatures (above 260°C).

Will corrode if in contact with ammonia.

NSW Module Resource Manual for National Metal and Engineering Courses-Welding and Thermal Cutting. Student Workbook p 104

Q. What are the advantages of braze welding?

A. Less heat input than fusion welding.
Expand the question to: What is fusion welding?

A. Less distortion.
Expand the question to: What does distortion mean?

A. Joins wider range of different metals.
Expand the question to: Which metals can it join?

Uses

Braze welding is used for repairing machinery and for fittings in maintenance work.

Other uses include making leak proof joints on small tanks and constructing furniture from hollow sections.

Braze welding is ideal for repairing broken or worn cast iron components.

NSW Module Resource Manual for National Metal and Engineering Courses-Welding and Thermal Cutting. Student Workbook p104

Q. Name 3 uses for braze welding.

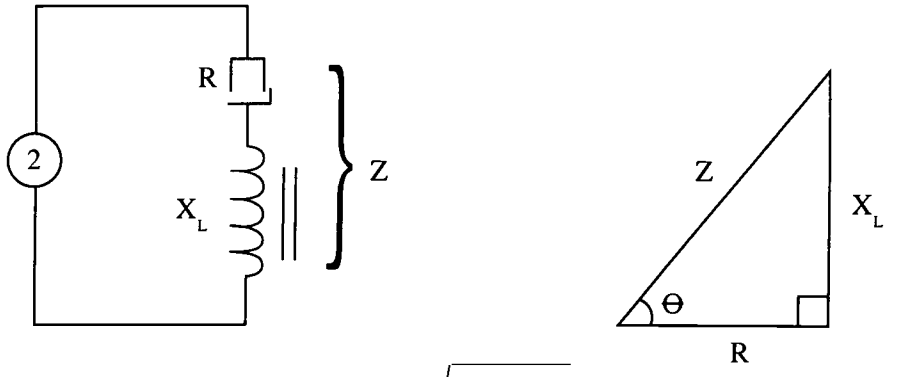
A. repairing machinery
making leak-proof joints
repairing broken cast iron

Strategy - Interpreting diagrams

You can use the previous strategy with a diagram such as the following:

Q. What does the symbol Z mean?

Figure 10: Series inductance-Resistance



$$Z = \sqrt{R^2 + X_L^2}$$

R = Resistance X_L = Inductive Reactance Z = Impedance

A. Impedance

Q. How would you calculate the impedance of the circuit?

A. _____

Q. R stands for_____and is measured in_____.

A. R stands for resistance and is measured in ohms.

Q. L stands for_____and is measured in_____.

A. L stands for inductive reactance and is measured in ohms.

Using key words from the text the student can make up questions about the words. Give students practice in drawing diagrams and labelling them using their list of key words. Students also need practice in explaining orally what the diagrams mean. Always go through the process of developing questions and answers with each new student or group. Questions are not always appropriate to use again as different students have different needs and are at different stages.

Strategy - Writing key points

In this strategy the student learns how to organise and categorise information from written texts into meaningful 'chunks' that will answer particular questions. These 'chunks' then become summaries for students to refer to when revising their work for assessments.

For example, using the question, 'What is the difference between a mechanical fuel pump and an electrical fuel pump?' demonstrate to the student how to locate the information in the text and write down key points, for example:

Mechanical	**Electrical**
slowly builds up pressure	instant pressure
used in carburettor fuel systems	use in fuel injected systems
reciprocating	rotary
bolts onto side of cylinder block	found in fuel tank or fuel line

If necessary, these points can then be restructured to represent other types of question structures, for example, multiple choice, cloze and so on. Writing down key points demonstrates to the student how to organise information into a form that is easy to learn from. It is also helpful to reverse this activity by providing answers for which the student has to construct questions.

Study Guides for Technical Courses

In this section Sue Sharrock describes a team teaching strategy used with Floor and Wall Tiling students and Kathy Salter describes how to use study guides for preparing for exams.

In the previous section, Carol Hayes described strategies for helping students construct their own questions and study sheets. In the following strategy, the team teachers construct study questions for the students. This is often appropriate in the early stages of a course. However, as students become more confident and skilled at reading their course notes and develop effective study techniques, strategies should be used that encourage students to develop skill in producing their own study sheets independently. This can be done by demonstrating the process of constructing questions then getting students to jointly construct questions in class, in small groups and then independently.

Strategy - Teacher-constructed study guides

Introduction

In the Floor and Wall Tiling course it was found that the students:

- did not read the module notes again after the initial reading with the vocational teacher;
- had difficulty understanding some of the terminology and expressions;
- had difficulty finding key points within a module;
- did not know where to start when preparing for their exam, so little or no preparation was done; and
- were overwhelmed with the amount of print they had to read.

In response to these difficulties the study guides were developed:

- to provide an acceptable format to encourage students to read their theory notes before an exam;
- to provide a focus for reading theory notes;
- to provide a structure that systematically guides the student's reading;
- to assist students from a non-English speaking background; and
- to help students identify the key points in a module.

Procedure

A Study Guide for each module was developed by both the Tutorial Support teacher and the vocational teacher using the module notes, exam paper and knowledge of the student's needs. The Study Guide is a series of questions that works sequentially through the module, essentially focusing on the key points. It may be between two pages and five pages long.

- Initially you will need to demonstrate how to use the guides, that is, ask students to have their notes open alongside the Study Guide and use the questions to guide their reading. Some students may need more individual support in learning how to use them.
- Working through the Study Guide with the students is a good form of revision and gives the students an opportunity to check their answers and share different ways of answering a question.
- In a team teaching situation you may encourage the students to hand in their Study Guides for checking.
- The Study Guide can be used by the vocational teacher for revision just prior to the exam.

- Show students how they can use the Study Guide when studying. (See strategy below.)

Going through the study guide in class creates lots of discussion, clarifying students' understandings and raising awareness of misunderstandings.

Four things need to be kept in mind when drafting a Study Guide:

1. Be aware of exam terminology used in the exam papers and give students experience in reading and using this terminology for example, 'list', 'function', 'define' and so on.
2. Make sure all learning outcomes are covered.
3. Focus on the key points in the course notes.
4. Use language that is used in the trade or vocational area.

To assist students who have difficulty with skimming and scanning, the Study Guide could use the same headings and sub-headings that are used in the theory notes. The same letter case should also be used.

Questions or statements may be either:

- cloze format
- completing the statement
- answering a question
- multiple choice

For example, in the module titled, Setting and Bricking Baths and Hobs, the course notes have the following section:

3] SETTING BATHS INTO POSITION

a) Check the bath for damage, twisting and is as selected.

b) Check that the waste is properly connected in the bath.

c) Find out if a specific height or position is required, i.e. finish floor heights, tile size or set out etc.

d) Check for platform, weephole and vents as required.

e) Make sure that the bath will not be sitting on any sharp objects.

Note: If the bath is twisted, select the best method for overcoming this problem. Level where most effective or evened out.

Setting and Bricking Baths and Hobs. Unpublished course notes Randwick TAFE.

The Study Guide for this particular section would be as follows:

From: SETTING BATHS INTO POSITION

a) What are the three things you must check the bath for?

_____

_____

_____

b) Check that the waste is _____ .

c) Check for _____ , _____ and _____ as required.

d) What do you do if the bath is twisted?

_____

The Study Guide is designed to be used in conjunction with the theory notes rather than as a test. The emphasis is on the notes in the module. Study Guides may need to be modified and/or revised from one year to the next as it is important for the Guides to reflect the needs of particular students.

Strategy - Using study guides for preparing for exams

Introduction

This strategy works for short answer questions only, that is, where questions and answers are on separate lines in the text. With this study strategy the student is practising the three skills needed for short answer type exams, namely, reading questions, recalling information and writing answers. Many students who have never studied before are motivated to use this strategy because they see it as training for the exam. It also appeals because it is a simple system where they cover their course work in much less time than reading through all their notes. It is also much more effective than just reading notes and summaries.

Procedure

1. Place a blank sheet of paper over the study questions and uncover the first question.
2. Recall the answer and write it down on the cover page.
3. Uncover the answer and check with your answer.
4. Uncover the next question and proceed as before.

Written Assignments

Marianne Wagner describes some of the strategies she uses with Advanced Certificate and Diploma level students in Welfare and Accounting, to help them develop strategies for completing essays and reports.

There are many books and workbooks available for teachers and students to assist them with researching and writing essays and reports. Only some of the more central aspects are dealt with here.

Developing research skills

Library familiarisation

Many students do not feel confident about using TAFE (and other) libraries. Workshops with library staff can be arranged, where library staff assist students to locate useful materials for a particular task. Students need to practise locating particular resources, especially in the reference and journal sections. Sometimes texts in great demand have not been placed on reserve, or if they have, students may not have understood what the reserve desk is. Additional library facilities, for example municipal and university libraries, can also be explored.

Keeping records of references

Students also need to be reminded of the importance of recording the details of sources they wish to use in their essays, and of writing down page numbers of ideas or quotations they wish to use. They should also be encouraged to list the reference and page numbers on all notes they make and on photocopies from reference books.

Clarifying the vocational teacher's expectations.

This is often extremely important and time consuming. Students may be quite uncertain about what the assignment question really means. For example, here is a question from an assignment for the subject—*Law and Community Welfare*. The assignment was linked to an excursion to observe courtroom activities and procedures.

> *'All persons are equally subject to the ordinary law of the land administered by the ordinary courts'. In the context of your visit to the Courts, make some notes about the validity of this quotation: Did you see any examples?*

The linking of commenting on the validity of the quotation with the court visit posed problems for the students. Most felt that differences in wealth, position, education and membership of a minority group, especially a socially disadvantaged one, meant that the quotation was not valid. However, many felt that they had not actually observed any unequal treatment in their single visit to the courts. The tutorial teacher suggested separating the question of the validity of the quotation from the question of what they'd observed in the courts.

Students need encouragement to check back with the vocational teacher about the aim of a question, and the teacher's expectations in cases such as this. Tutorial teachers should always check their interpretation of a question with the vocational teacher.

Clarifying the meanings of written assignment questions

Sometimes confusion about concepts may be at the root of students' uncertainty about how to tackle an assignment. Here is an example from the Welfare subject—*Human Behaviour 1*.

> *Human life span development is presented as a process involving growth through a number of stages in which the growing individual interacts with his/her social environment. Select one chronological group and:*
>
> *–outline the significant features of physical, intellectual, social and personality development, and,*
>
> *–select two critical issues/processes associated with the age cohort and analyse the interaction on the development of the individual.*
>
> *Word limit: 1500*

Students first said that they did not know what was meant by issues and processes, nor did they know where they would find out about them. They also had trouble recognising that the instruction implied they could choose two issues or two processes, or one of each.

Strategy - Scanning to identify issues

Encouraging students to consult textbooks and reference books to build up background knowledge can sometimes assist them to understand how to answer a question.

In the example above the Tutorial Support teacher asked the students to scan for references to issues and processes in human development in reference books.

The tutorial group discovered that issues and processes were identified at the start of the chapters dealing with particular age groups and discussed throughout the chapters. They looked at examples of issues and examples of processes and noted that the distinction between them seemed blurred at times. They also noted that making a distinction between an issue and a process was perhaps not critical to the task. This lack of clarity may not be easy for students to accept. They also noted that features of physical, intellectual, social and personality development were outlined under separate headings in the chapters.

Strategy - Classifying and concept checking through writing

Concept checking can be done through analysing a student's first drafts. In the above example several students were confusing features of development with issues or processes. For example, they included issues affecting the age group's health under 'Physical features of development'.

Several students divided the first task of outlining the features of development into three parts (not four, as their reference books did). This was because they had interpreted the assignment as requiring them to write about social and personality development in one block, rather than under separate headings, that is, one section on 'social development' and a separate one for 'personality development'.

Writing an essay, report or assignment

Students need encouragement to:

- brainstorm what they think should be included in a particular answer;
- plan the order in which they will present this information and how they will organise it, for example chronologically, or according to issues or points of view; and
- draft and re-draft.

For example, in the subject, *Social Processes 1*, Welfare students were given the question:

Discuss the development of multiculturalism in Australia:

(a) What are its origins?

(b) What differing definitions are there for the term?

When they brainstormed what they thought should go into part (a) they came up with all kinds of aspects of Australia's history and policies of migration. They decided they could either arrange these chronologically or

according to key issues. In their drafts it became obvious that they also had to consider how to keep the essay focused on the question. The aim was not to summarise the history of migration in Australia, but to analyse how and why multiculturalism arose out of this history.

Students often need to do some joint construction of essay sections, or a complete essay or report, to develop skill and confidence to attack such tasks independently. In giving feedback on student drafts, the Tutorial Support teacher should not only look at aspects such as grammar, spelling and cohesion but also at organisation, layout and clarity of ideas.

Dealing with Personal Issues

Ideally, the Tutorial Support session should be a safe place for students to voice their frustration and fears and to let off steam about something that upsets them, particularly if they are considering discontinuing the course. On the other hand, it is not desirable for the ABE or ESOL teacher to be seen as overly critical or unsupportive of their vocational colleagues. If students come to a tutorial needing to talk about a particular issue first try to encourage them to express their feelings. Sometimes this is all that is necessary.

For example, K, an NESB Welfare student, had been doing a counselling role play with an ESB student for fifteen minutes. At the end of this time the ESB student, by making a totally inappropriate response, indicated that she had virtually understood nothing of what K had said. Although the vocational teacher pointed out that the ESB student should have sought clarification early in the interview, K felt really upset and was considering discontinuing the course. After expressing her feelings, and being reassured by the others in the tutorial group that they found K quite easy to understand, and also that this ESB student generally had problems concentrating on the task at hand, K felt much better.

In other circumstances students, after expressing their feelings, want to move on to consider how they would like the situation to change and what they could do to bring this about. For example, one Welfare student felt that the assignment demands made by a particular teacher were excessive for an Advanced Certificate course. She also felt resentful because the teacher did not seem to be meeting her own commitments to the students in terms of assisting them to arrange their agency placements and in terms of organising feedback sessions for these placements.

The issue was whether the student wanted to go beyond renegotiating the terms of a particular assignment, to questioning the suitability of the workload for an Advanced Certificate course, or even to expressing disappointment in how the teacher had handled her commitments to the class.

Strategies - Dealing with personal issues

Sometimes a role play, in which the students practise expressing themselves assertively might be helpful and appropriate.

Some personal issues however should be referred to counsellors.

When relationships with vocational teachers are good then issues and concerns of students can be raised as part of normal liaison.

SECTION 4

MATHS STRATEGIES

Introduction

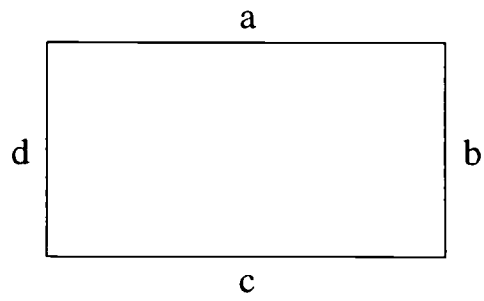
There are a number of issues which cause students enrolled in vocational courses to have difficulty with maths. Students often do not know how to apply the numeracy skills they have acquired at school to the vocational context. There can be a gap between their knowledge of maths in theory and the application required by the trade. There may also be a gap between the skills mastered at school and those required by the course. Another area of difficulty is relating the theory of the classroom to the practice of the workshop and vice versa. The different kinds of language used in various aspects of the course, and in assessment, can be a stumbling block. Feelings about maths and expectations of the course can also present barriers to students.

Examples of Student Difficulties

Relating school maths to the application required by the course

Maths has evolved in various jobs and courses to suit the requirements of the context. We can't assume that formulae or approaches taught at school are always appropriate in the technical context. Always check with the class teacher first. For example, the system commonly used in the building trades for working out the perimeter of rooms is to start at a corner and go around the room in a clockwise direction. It is done this way to develop a systematic way of solving more complex problems later on in the course.

Figure 11: Calculating the perimeter



So the perimeter is a+b+c+d

At school, students are taught that perimeter is 2L+2B or 2(L+B), on the assumption that all rooms are symmetrical and have four sides. They will be unfamiliar with the method taught in the building trades.

Another example is the formula for area of a circle used in schools, πr^2. Many vocational courses use a different formula, $\frac{\pi d^2}{4}$. Once again the customary formula needs to be checked with the course teacher.

Sometimes, methods used in vocational courses can be more or less precise than the student is used to. For example, students may be familiar with pi as 3.14. Their course may require pi to be valued at $\frac{22}{7}$, or 3.1416. For further examples of school maths compared with different trades see *Vocational Mathematics Manual*, 1990, Division of Adult Basic Education, TAFE NSW.

The gap between skills mastered at school and those required by the course

- Many courses assume transposition is taught in secondary school, which is not always the case. Students may be familiar with substitution as an alternative method.
- Students may have difficulty converting within the metric system, or from imperial to metric or vice versa. They may not be familiar with imperial measurement because it is not part of school maths.
- Students may be unfamiliar with a scientific calculator, or rely too much on a calculator to 'get it right', without using some informal method of estimating, or relating to common sense expectations to check answers.
- Students may be unfamiliar with particular vocational methods used which may be more or less precise than those the student is familiar with.

Relating the theory of the classroom to the practice of the workshop and vice versa.

- Students may have difficulty in linking the symbols in formulae to the related concepts and how they are used in practice.
- Students may manipulate numbers with a calculator, but have little concept of the size of the numbers they are dealing with, especially decimals. This also means they have little concept of what is a reasonable answer.
- Students may have difficulty relating a two dimensional diagram on paper to the three dimensional reality.

The language used in the course

- The more formal language used in the theoretical parts of the course, and in exams, can be a stumbling block.
- Students, especially NESB students, may be familiar with the maths, but unfamiliar with the maths language or methods used in the course, for example, words such as *wastage* and *on costs*.
- Students may be unfamiliar with the idiomatic language used in the classroom.
- When solving mathematical problems vocational teachers may present material in a different way and use different language to that used at school.

Feelings about maths

- Students may be anxious about maths.
- Students may lack confidence about maths and try to avoid it.

Expectations about the course

- Students may be expecting a practical course, with lots of hands on application and little or no theory. They may be unaware of, and unprepared for, the theoretical and mathematical demands of their course.

Planning

There are a number of issues that need to be considered when planning maths Tutorial Support.

- Before you start to work with individual students needing help with maths, find out whether they were assessed at the beginning of the course. You should have access to these assessments in planning Tutorial Support, and in deciding if further assessment is required.
- When students seek help, formal assessment is probably not the most effective way of assessing needs. Informal discussions of difficulties with the student may glean much more useful information. Ask them to tell you what they are doing and show you what they have done. By watching and listening, you can work out what the student knows, as well as the areas of difficulty. This is particularly helpful in working out if the difficulty is in applying the maths, or in understanding the concepts that are being applied.
- Team Teaching is the most effective way of presenting Tutorial Support, allowing students to have access to the expertise of the vocational teacher and the Tutorial Support teacher at the same time. This is not always possible, due to constraints of course delivery, timetabling, personalities and so on. If you are working with students withdrawn from the vocational classroom, find out beforehand, if possible, what the vocational teacher is doing each week. For example, ask for a copy of the teacher's notes, or have a brief meeting with the teacher to discuss the class. You may also want to sit in on the theory sessions of the course to build your understanding of how maths is applied in the particular course. Maths always needs to be presented in the context of the course, not as isolated skills.
- There is a need for continuing liaison with the vocational teacher, whatever the mode of delivery of Tutorial Support.
- An important question for the Tutorial Support teacher to ask is, 'What do I plan to work on each week with the student and how do I decide?' Some possibilities are: working on the content of the previous lesson based on difficulties the student identifies; or preparing for the next lesson, working on skills the student will need to be successful.
- Maths demands of courses vary greatly. Find out about the demands of a course and make sure you have the necessary maths understanding required before embarking on Tutorial Support.

- You need to know what maths is used in the course, and how it is applied. The following questions provide a starting point to building your knowledge about the requirements of a particular course.

Maths demands of the course - overview

It is helpful to have an overview of the maths demands of a particular course. Tutorial Support teachers must be consciously looking to answer the following questions while they are working on a course. They can also approach the vocational teacher to find some of the answers.

- What is the entry level for the course?
- What mathematical understanding is required/assumed in the course?
- Is there a discrepancy between the entry level and the maths demands?
- How is the maths content applied in the course?
- How is the maths content of the course assessed?
- How is the maths content taught? For example, is there a separate 'calcs' class, or is it included as required in the body of the course? How much is the maths related to practice, and how much is taught in isolation?
- What are common student difficulties?
- Are there discrepancies between what is taught and what is examined?

Maths demands of the course - specific

Having the above information, plus individual assessments, will help the Tutorial Support teacher to understand students' needs in the course, and to plan the mode and content of delivery. The teacher also needs to do a more in-depth analysis of the maths demands of a course such as that shown in Table 1.

Table 1: A guide for auditing maths content of a course

What measurements are used in the course?	Metric or imperial or both? Is it length, mass, volume, force, capacity, power, etc?
Which conversions are used?	millimetres to metres? millilitres to litres? kilograms to grams? weight to percentage? e.g. in Ceramic Glazing percentage to weight to capacity? e.g. liquids in Bakery metric to imperial?
Which units are used?	Carpentry and Joinery use mm. Fashion use cm.
What degree of accuracy is needed?	Bakery is + or – 1% Fitting and Machining use a tolerance of 0.01 for general machining.
What measuring instruments are used?	Tapes, micrometers, electronic?
What drawing instruments are used?	Compass, protractor, scale rule? Software e.g. CAD?
Which scales are used in the course?	e.g. 1:100

How do they use rounding off?	Rounding off can vary from trade to trade. You will need to know the accuracy used in trade calculations, e.g.Upwards from 1.8m timber orders are rounded off to units of 0.3m.
Do estimating skills need to be taught?	Many students come to TAFE with poor estimating skills.
How is a job costed?	This varies from trade to trade and may also vary depending on the type of job.
Which formulae are used, and how do they vary from school formulae?	e.g. The formula for area of a circle may use diameter instead of radius.
How are formulae applied?	Do students need to transpose formulae, or do they only need to insert quantities for symbols?
How are percentages used?	e.g. add 10% for wastage. Is the % button required?
What sort of calculator skills are needed?	Scientific or just basic processes?
What statistics are used in the course?	More courses are including statistics, but the statistics components are often hidden.

Problem Solving

Introduction

Successful problem solving requires a systematic approach to working out what is required: selecting and organising the necessary information, choosing an appropriate method, using that method and checking the appropriateness of results.

Many students are haphazard in their approach to maths problems. They tend to see them as having no relation to the real world, but rather as representing some set of abstract rules about which they have little idea. They are likely to use the first method they think of, and to make no attempt to check their answer against their common sense.

Strategy - The 5 step method

A good model for helping students with problem solving is the 5 Step Method. (Thiering, Hatherly & McLeod, 1987). The steps are as follows:

1. Get to know the problem.
2. Decide what to do.
3. Estimate the answer.
4. Do it.
5. Look back. Is the answer reasonable? Does it make sense based on the student's experience? Is it a lot more or less than the estimate?

The following article by Lorene Barin (1989) provides an example of how this approach can be applied. It is a successful approach for students because it gives them not only a method for trade calculations but also an approach that works for all decision making.

My Approach to Solving Maths Problems*

by Lorene Barin 1989

I had a trade student say to me recently, 'Look I can do the calcs–I just want you to teach me so that I can remember the steps by rote.'

I asked him to explain his trade calculations to me, which he did quite easily. He certainly understood all of the mathematical and trade concepts behind the calculations. What he didn't understand was that the mathematical problem posed by his trade teacher did not require rote learning. In his past schooling the student had come to believe that maths was something which required rote learning of ways to do things. Once he remembered the teacher's way of doing things he succeeded in getting the right answer and that's how he thought people became 'good' at maths.

I explained to him that rather than trying to remember all the different problems he was asked to do, I would show him a general approach to tackling all problems. This approach is based on Polya's (1957) approach and Thiering, McLeod and Hatherly's (1987) approach. The steps I explained to my student were as follows. (In fact my explanation was more specific and trade-related than this general account.)

1. Getting to know the problem

I asked my student to explain the given plan to me and to tell me in his own words what the question was about. (Talking about a problem is very important to clarify ideas.) I asked him if he had come across anything in this question (and what it related to) before, either in his trade experience or his general experience? I was trying to help him put the problem in context so that his understanding of it would be increased. I also asked him to jot down any information he thought might help to solve the problem. This problem already supplied a diagram but sometimes it is helpful to draw your own diagram to get to know a problem. Using models and real-life materials also helps students.

2. Choosing what to do

Now that he had what he thought was enough information, what was he going to do with it? I told him to look at the question again and find out what exactly the question was asking of him. Had he been asked a similar question before? If so, what did he do then and why did he do it? What were the differences between what he was being asked now and what he was asked then? I was encouraging him to use his prior knowledge and understanding to see whether this could be adapted to a similar situation. Would any formulae help him to answer the questions? Did he need to be careful about the units he was using and perhaps change millimetres to metres? What was his trade's usual way of laying out the problem? He wrote down what he was going to do with the information and was ever-ready to punch numbers into his calculator. I stopped him and asked him to try to predict a rough answer for those steps in the question where it was practical to do so. (The question was asked in steps from a-d and only in some parts could he predict a rough answer in a short time.)

3. Predicting a rough answer

This is a step which my student didn't really see the point of. He thought it was a waste of time. I explained to him that in general, predicting a rough answer was important because it provides a comparison to the answer obtained. It allows students to check on the reasonableness of an answer. It encourages students to re-examine and re-confirm their thinking about a problem. And predicting a rough answer does not necessarily take a lot of time - If it does, it may be a waste of time!

* This is a reformatted version of Barin, L. (1989) *'My Approach to Solving Maths Problems' Good Practice* No 5 PP 9–10. Commonwealth of Australia copyright reproduced by permission.

In general, predicting a rough answer consists of the following range of estimation areas and may include any or all of these areas:

a. Estimating using number skills: ·

rounding numbers to the nearest whole number or the nearest ten (e.g. 2390 rounded to the nearest 100 is 2400)

handling multiplication and division with zeros e.g. 20×45, and $1000 \div 20$)

choosing the round numbers that make estimating easier to do

deciding whether the estimate is bigger or smaller than the exact measure.

b. Estimating using maths sense or knowledge:

e.g. 'from 20% – 50% off' means that at a sale where the original item price was $120, what you would now have to pay is between $60 and a little less than $100.

c. Estimating using size concepts and general knowledge:

e.g. by understanding the concepts of the size of a square metre or cubic metre using a cubic metre kit, the students can realise how unreasonable it would be if they get an answer that requires 50 600 cubic metres of concrete for a domestic pathway!

4. Doing it

Finally my student followed what he had written down and used his 'draft' to get some of the solutions. There were some steps where he didn't predict a rough answer so I suggested he repeat his calculations on his calculator. This didn't take much time and was a check on his working.

5. Looking back

Finally I asked him to look back at the question and also compare his predictions with his answers. I suggested that he answer the question according to the wording of the question so that it all made sense to him. He was quite happy to do this and seemed satisfied with himself.

After we had finished with the question I asked him if what I had explained to him made sense. He agreed. He had several goes at using these strategies and kept a summary of them for future use. I suspect that after some time of approaching problems this way, he will develop his own approach to solving problems which will incorporate these steps.

So what has come out of this example? First and foremost it needs to be recognised that doing maths is a process based on thinking and understanding. The teaching of mathematics should encourage students to think about what they are doing and why they are doing it. From understanding maths, many given 'rules' have evolved which unfortunately seem to have replaced what doing maths is all about. We need to think about and understand the mathematical concepts and the context of the situation before we are able to formulate any of our own rules or apply any 'given' rules. This approach to solving problems works because it is based on students' thinking about what they are doing, questioning their understanding and applying what has evolved from that understanding. If students don't understand the concepts and context of a problem then that understanding cannot be used to solve a problem. I believe it is up to the teacher to provide situations which enable students to discover and understand the mathematical and general concepts which they need, and then to encourage them to apply their understanding, either to similar situations or to not-so-similar situations.

References

George Polya, *How to Solve It*, Doubleday and Garden City, N.Y. 1957.

Thiering, J., McLeod, J. & Hatherly, S., *Trade Mathematics: A Handbook for Teachers*, Thomas Nelson, 1987.

Strategy - Roadmaps

In this section Michael Keating describes a strategy he uses in a number of Trade Certificate courses.

Introduction

Roadmaps provide students with a step by step framework for solving a problem. Often in vocational courses students are tested on their ability to solve a problem and on their skill in organising and setting it out. The number of steps involved in this process can be too much to tackle in one go. Roadmaps provide a way of breaking the process into a number of manageable chunks. By following roadmaps the students build up an understanding of the problem solving process, until they are able to organise and complete the process themselves.

This strategy is particularly useful in helping students to deal with the time constraints in many courses, when they are expected to be able to solve problems immediately. It also builds student confidence. Clearly, students need to be encouraged to think about the problem, and ask questions, to build up their understanding whilst they are using the roadmaps.

Procedure

There are three stages in the process:

Stage 1

The roadmaps provide the student with the formulae and the setting out. Students need to read and understand the purpose of the problem, choose the information necessary for solving the problem, insert this information at appropriate points on the roadmap, do the necessary calculations and check the appropriateness of their answer.

Stage 2

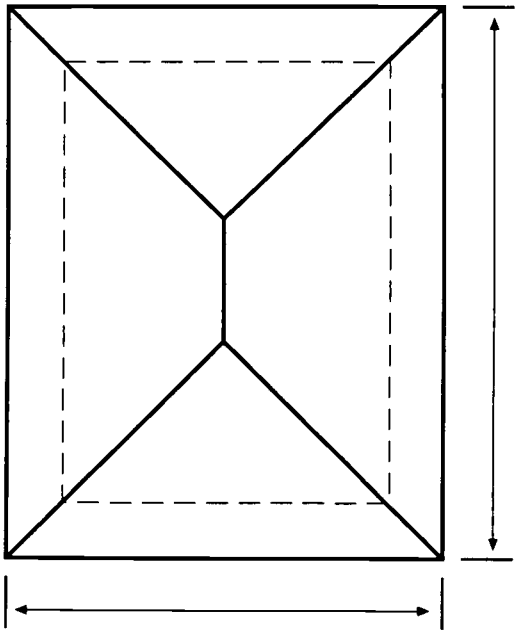
In this stage, the roadmaps are less detailed. They provide a skeleton structure, with some setting out. Students need to add the formulae and complete the setting out, and then go on to find their answer.

Stage 3

In this stage students work straight from the question, providing their own setting out and choosing appropriate formulae.

Examples of the three stages are taken from a Building calculation.

Hipped roof calculations Stage 1



Q. Find the set out and order lengths for:

(i) RAFTERS

(ii) HIPS

details: PITCH 1: _____

OVERHANG (OH) = _____ mm

Rise/m run = _____

(i) T/L RAFTERS $r = \sqrt{\text{rise/m run}^2 + 1}$

$= \sqrt{(\quad)^2 + 1} =$ _____

(a) Set out = $\frac{\text{_____}}{r} \times \frac{\text{_____}}{\frac{1}{2}\text{ span}} =$ _____

(b) Order = $\frac{\text{_____}}{r} \times \frac{\text{_____}}{(\frac{1}{2}\text{ span} + \text{OH})} =$ _____ + 100mm

= _____ ⇒ _____

(ii) T/L Hip $h = \sqrt{\text{rise/m run}^2 + 2}$

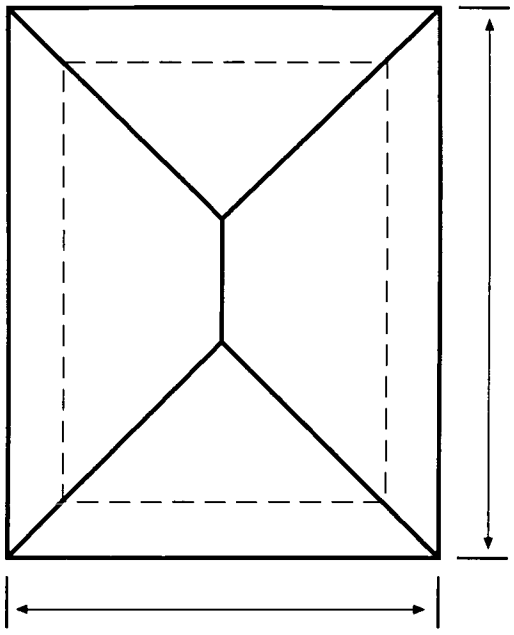
$= \sqrt{(\quad)^2 + 2} =$ _____

(a) Set out = $\frac{\text{_____}}{h} \times \frac{\text{_____}}{\frac{1}{2}\text{ span}} =$ _____

(b) Order = $\frac{\text{_____}}{h} \times \frac{\text{_____}}{(\frac{1}{2}\text{ span} + \text{OH})} =$ _____ + 100mm

= _____ ⇒ _____

Hipped roof calculations Stage 2



Q. Find the set out and order lengths for:

(i) RAFTERS

(ii) HIPS

details: PITCH 1: _____

OVERHANG (OH) = _____ mm

Rise/m run = _____

(i) T/L RAFTERS r = _____ ← **Formula**

= _____ = _____

(a) Set out = $\frac{\text{_____}}{\text{r}}$ x $\frac{\text{_____}}{\frac{1}{2}\text{ span}}$ = _____

(b) Order = $\frac{\text{_____}}{\text{r}}$ x $\frac{\text{_____}}{(\frac{1}{2}\text{ span} + \text{OH})}$ = _____

= _____ ⇒ _____

(ii) T/L Hip h = _____ ← **Formula**

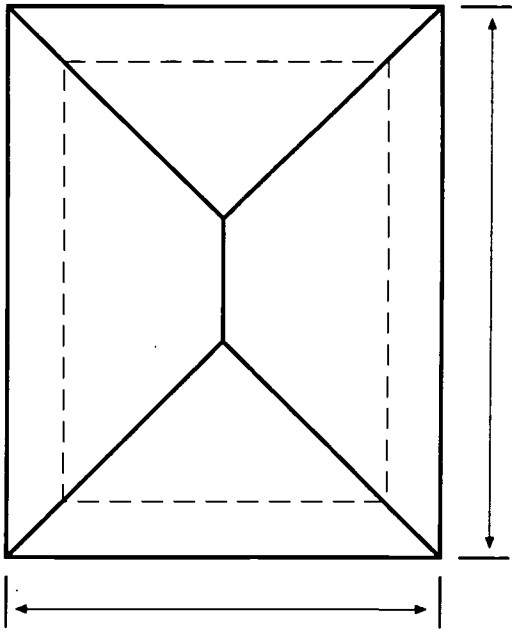
= _____ = _____

(a) Set out = $\frac{\text{_____}}{\text{h}}$ x $\frac{\text{_____}}{\frac{1}{2}\text{ span}}$ = _____

(b) Order = $\frac{\text{_____}}{\text{h}}$ x $\frac{\text{_____}}{(\frac{1}{2}\text{ span} + \text{OH})}$ = _____ +100mm

= _____ ⇒ _____

Hipped roof calculations Stage 3



Q. Find the set out and order lengths for:

(i) RAFTERS

(ii) HIPS

details: PITCH 1: _____

OVERHANG (OH) = _____ mm

(i) T/L RAFTERS r =

(a) Set out =

(b) Order =

(ii) T/L Hip h =

(a) Set out =

(b) Order =

Using a Calculator

In this section Judith Partlin describes strategies applicable to all students using calculators.

Introduction

Calculators are often used on the job and as part of a vocational course. Many students are either not confident using a calculator, or are over-reliant, trusting it to come up with the right answer without a checking strategy.

Strategies - Using a calculator

The following are some basic principles to use when working with students with calculators.

- Always check which type of calculator the student is expected to use. Do they need a scientific calculator, or is a basic one sufficient? Choose the one most appropriate to the student's needs. Only use a scientific calculator if it is needed. Another important aspect is whether the size of the calculator is suitable for the student. For example, a very small calculator doesn't suit a person with large fingers.

- Estimation and rounding off are two essential skills for calculator use. Estimation is required to check accuracy of answers. To do this students have to have some understanding of the maths involved. Rounding off is helpful in estimation and in dealing with the large number of decimal places likely to be found on the calculator display during use. *Teaching Vocational Mathematics* by Thiering, Hatherly and McLeod (1992) gives examples of how to develop these skills. Use whatever calculations the student is working on to practise these skills.

- Accurate use of the calculator is essential particularly when working out formulae. Often students think that doing a calculation twice on the calculator and getting the same answer makes it right. However, it has been shown that if a person keys in incorrectly, they are likely to do the same thing a second time. So an idea of what the answer is likely to be, or a feel for whether or not the answer makes sense, is vital. If the answer doesn't make sense, the student needs to go back and think the process through again. Being familiar with and using a problem solving approach such as the 5 Step Method (described above) is very helpful in these situations.

- If students are getting the wrong answer, watch how they use the calculator and talk with them about what they are doing. This will often show where the students are going wrong and allow the Tutorial Support teacher to model correct practice.
- Students often have a 'straight to the calculator' habit which is difficult to break. The following teaching strategy, which is a variation on the 5 Step Method, is helpful in breaking this habit.

  Step 1: Insist they write down the formula first and constantly reinforce this step.

  It is very important to explain to students why you are asking them to write the formula first. Tell them it is like an insurance policy. It helps them reduce the chances of making mistakes. It also helps to set the formula in their long term memory.

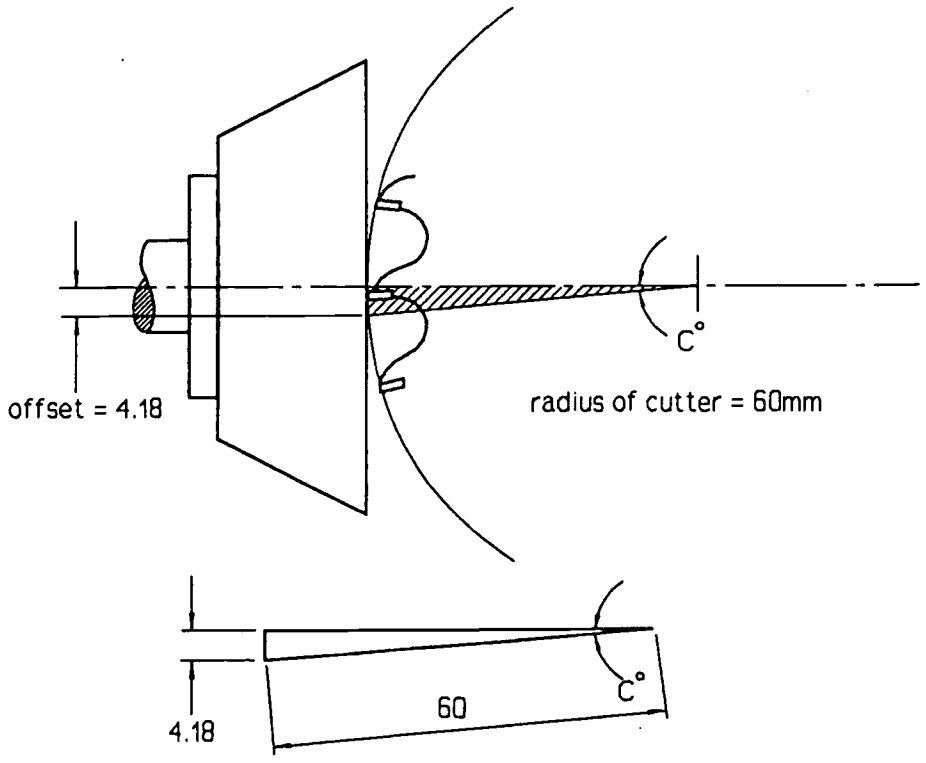
  Step 2: Write the numbers into the formula.

  Step 3: Write an estimate (or 'commonsense') answer.

  Step 4: Student and teacher use calculators.

  Step 5: Student checks answer against estimate and makes a decision about the acceptability of the answer.
- The more times you press the calculator buttons, the more likely you are to make a mistake. Showing the student ways to cut down the number of key strokes is helpful.
- All calculators do not work the same way. Students may need help to explore how their calculators work. This applies to some fairly simple operations such as percentage, through to order of operations and use of the inverse key. Also, a formula does not necessarily tell you the order in which to press the buttons on the calculator. For example, in the following example from the Mechanical Engineering Trade course (Fitting and Machining), Engineering Science Module, use of trigonometry is required.

Figure 12: Use of Trigonometry



Question: Find the clearance angle being ground on the cutter

National Metal and Engineering Module, NBB13: Engineering Science, p39

The appropriate formula is:

Sine C = opposite/hypotenuse

Inserting the given information in the formula, you would have

Sine C = Opposite/hypotenuse

= 4.18 ÷ 60

= 0.0697

This is as far as the formula takes you. You need to know that this is the sine of the angle, and also how to get the angle itself. Depending on the calculator, this probably involves pressing the 2nd function key, then the sin key, and the calculator will display 3.9948. By then pressing the D°M'S key you will see 3°59' (the angle you want).

As you can see the formula does not tell you which buttons to press. So learning the formula by rote does not help you to get the final steps correct.

Opportunities for practice are vital when learning to apply formulae. Going through the process once or twice is seldom enough. Practice also helps students develop a 'feel' for the expected size of the answer. They need to be required to predict whether the answer is likely to be large or small.

Assisting Students with their Drawing Skills

Strategies in this section were contributed by Judith Partlin.

Introduction

Drawing skills are required in a number of vocational courses, for example Plumbing, Carpentry and Joinery, and Fitting and Machining.

Many students have difficulty with some aspects of the drawing required in their course. There are a number of reasons for this. Much of the geometry is treated in years seven and eight of high school, so it will be at least several years since the students have needed to think about it. A lot of the skills required and assumed are taught in Technical Drawing, and many students will not have studied this subject. Some students have poor spatial awareness and are unable to visualise a flat view of a solid form and vice versa. Also drawing conventions may differ from one culture to another, for example, ways of dealing with perspective. Lack of confidence may be another issue for students.

Drawing skills are taught by the vocational teacher but the Tutorial Support teacher can give maths and language support, and help students with the hands on skills required to use the drawing instruments. The following guidelines cover the main areas in which the Tutorial Support teacher can assist. These skills are more effectively learned using a team teaching approach as it is very difficult to deal with student problems without the vocational teacher being present.

General Principles

- Watch what the student does to see if there is anything you can show them to improve their technique.
- Demonstrate and describe what you are doing while you are doing it.
- Encourage the student to try.

This is a cyclical process which may need to be gone through a number of times, and on several occasions, to achieve competence.

Strategy - Confident use of drawing instruments

Basic drawing skills are needed in a variety of courses to do activities ranging from bisecting lines and angles to dividing lines in specified ratios and drawing scale plans.

Compass

Check that the student can:

- insert the lead or pencil;
- ensure the points of the lead or pencil and compass are in line;
- locate the point of the compass accurately, in the correct position;
- pivot the lead by twisting the top of the compass; and
- use one hand only, with a light touch.

Set squares

The two set squares used are 30 – 60, and 45 degrees. Students need to know the difference between them and when to use each one. This varies from course to course and the Tutorial Support teacher should consult the vocational teacher about how they are used in the particular course.

Scale rulers

Check with the vocational teacher about which scales are used in the course. Then work on the scales the student needs.

For a scale of 1:50, each small division is 50mm (a big division is 1m).

For a scale of 1:500, each small division is 500mm (a big division is 10m).

Ordinary ruler

While this may seem relatively simple, students easily develop bad habits. Make sure that students start measuring at zero, and have their eyes directly over the measurement to be read.

Protractor

Common difficulties are reading the wrong scale, that is starting from 180° rather than 0°, lining it up incorrectly and placing the centre incorrectly. Year seven and eight text books provide instructions for correct use. Wherever possible encourage the use of a 360° protractor with a scale of 0° to 360°.

Perspective and orthographic projection

Shop Fitting, and Carpentry and Joinery are just two of the courses that require these skills. Both involve drawing in perspective from different points to show how a design might look from that point. This is best taught in a team teaching situation, or at the least the Tutorial Support teacher needs to observe how it is taught in the classroom and what the teacher expects for aspects such as layout.

Models can be helpful in developing skill in this area. Check the availability of models with the vocational section, for example, Carpentry and Joinery which has excellent models. (See *Strategy –Use of models*, below.)

Setting out

The standards expected will vary from course to course and teacher to teacher. Check with the course teacher for standards of presentation, use of conventions of drawing, types of pencils and other equipment, and how the equipment is used.

Understanding instructions

Often verbal instructions are the main form of instruction in drawing classes. Students can have difficulty following verbal instructions, and/or remembering them. The Tutorial Support teacher will need to check instructions with the vocational teacher, and once again a team teaching situation is the most effective way to meet students' needs in this area. The Tutorial Support teacher may want to negotiate with the vocational teacher about providing written instructions. In a team teaching situation there would be an opportunity for the Tutorial Support teacher to write notes for example, on an OHP, while the vocational teacher is giving instructions. These could then be copied for the students.

NESB students may have more difficulty with the vocabulary than ESB students. Extra support may be required in this area.

Remembering Formulae

In this section Eunice Wilson describes a strategy she has used in a range of courses.

Introduction

Mnemonics are memory joggers. They relate the symbols in a formula to real life experience, to something the student knows or is interested in. They can be funny, rude, practical, nonsensical. They may rely on rhythm, or on word/symbol association.

Formulae are statements set out in symbols which represent concepts, and appear quite removed from the context which gives them meaning. Students can have difficulty recalling them, especially when there are many formulae to remember and apply, and time pressure due to assessment demands. They can become frustrated and rely on ineffective learning methods. Mnemonics can be effective memory triggers for students with different learning preferences. For aural learners, rhythm may be the most important aspect. For visual learners, the look of it will be the focus, and for kinaesthetic learners, the feel of writing it will help. Using mnemonics usually combines a variety of learning styles.

Strategy - Mnemonics

Discuss with students how they might remember formulae. Some methods which may make it easier for them to remember are:

- writing and rewriting;
- the *look, cover, write, check* method used when learning spelling;
- mnemonics.

Students often enjoy mnemonics. The most effective ones are those that the students develop for themselves. They may find the following examples useful, or they can be used as models to start the students developing their own. Encourage students to work out which of the following methods best helps them remember—saying it aloud as often as possible, writing it, visualising or looking at it. Here are some examples from trade courses.

Carpentry and Joinery

1. Formula for the area of a rectangle is A = L X B

   Remember it like this:

   A Long Board (The shape of a long board is a rectangle.)

2. Formula for the area of a circle is $A = \pi r^2$

   Remember it like this:

   A pie is round and round (The shape of a pie is circular.)

3. Other formulae for the area of a circle are $\pi\left(\frac{d}{2}\right)^2$, $\frac{\pi d^2}{4}$

   Remember them like this:

   A pie dancing on two squares;

   A pie dividing squares into 4.

4. Formula for the area of a triangle is $A = \frac{1}{2}$ bh

   Remember it like this:

   Half a brick house

Trigonometry

The three trigonometric ratios are:

- Sin = opposite/hypotenuse
- Cos = adjacent/hypotenuse
- Tan = opposite/adjacent

Some mnemonics for Sin, Cos and Tan are:

- *Oh heck another hour of algebra* (SOH, CAH, TOA);
- *Some old has-beens can always hide their old age* (SOH, CAH, TOA);
- *Sohcahtoa*–the secret is in the pronunciation: Soh as in sock, cah as in car, toa as in toe-uh. This mnemonic relies particularly on rhythm, the stress is on the third syllable, 'toe'.

Mechanical Engineering Trade (Fitting and Machining)

Mechanical Advantage = Load/Effort

MA = L/E

Remember it like this:

Many acrobats leap over elephants.

Hairdressing

The five layers of the epidermis are:

Corneum
Lucidum

Granulosum
Mucosum
Germinativum

Remember them like this:

Come lucy grandma must go, or *Cows love green moist grass.*

The functions of the skin are:

Sensation
Heat-regulation
Absorption
Protection
Excretion
Secretion

Remember them like this: *SHAPES*

Relating the Abstract to the Concrete

In the article that follows, published in** Good Practice,* *** Carolyn Glossop describes how she worked with Carpentry and Joinery teachers and students, and in particular, her use of visualisation techniques.

Strategy - Visualisation

Introduction

Visualisation encourages students to relate an abstract idea, for example one cubic metre of concrete, to objects with which they are familiar. Often students have little idea of the size of the measurements with which they are working. They calculate quantities, but the numbers have little meaning to them. They may make a mistake on the calculator and not see that the answer is impossible. Helping students visualise measurements such as volume, mass, and length by relating measurements to the real world, gives them a commonsense tool with which to evaluate the feasibility of their answers. Students can more easily see the meaning in a calculation if they can relate it to their experience and move from the real world, to the calculation, and back to the real world.

* Following is a reformatted version of Glossop, G. *'Team Teaching in Carpentry and Joinery' Gaad Practice*, No 11, pp 14-17. Commonwealth of Australia. Copyright reproduced by permission.

Team teaching in Carpentry and Joinery

Carolyn Glossop shows trade students how maths works on the job

While team teaching on three Stage 1 Carpentry and Joinery classes at Gosford College of TAFE I was able to learn effective methods of presenting vocational material. Team teaching allowed me to learn the trade theory and also what was expected of the students. I was able to help the students experiencing difficulties immediately, before they fell behind.

After the lesson, the vocational teacher and I would discuss the difficulties the students were having and what we would do to overcome those for the next lesson.

My role varied - sometimes I would teach a numeracy concept, or would make suggestions or provide ideas, or just be supportive and help students with their calculations.

An example of one of the techniques we used which proved to be effective was with Pythagoras' Theorem. We decided that I would explain it with diagrams, in the workshop, and then the vocational teacher would explain how it was used in industry. We would then immediately apply this concept to setting out framework and making sure it was 'square'.

As we climbed over bearers and joists, I encouraged the students to talk their way through what they were doing to clarify it in their minds. It became clear to the students the practical applications of the theory and how they needed to know it to work out a right angle when they only had a string line.

Over the year, I developed worksheets which became a book. I thought that what I had learnt might be helpful to teachers working with Carpentry and Joinery students in a withdrawal situation.

When teaching, I used a visual approach with lots of discussion, encouraging the student to talk his way through the stages of a problem. I tried to incorporate that philosophy into the book. I emphasised the specific areas with which students had the most difficulty and provided explanations in Plain English plus exercises and answers.

Here are some samples of parts of my chapters on volume:

VOLUME

When do you use volume in C & J?

You need it to work out the amount of concrete to order to pour a slab.

Remember

Always look at your answer. Picture the slab. Does the answer look right? If not, check your answer and check your decimal point.

Estimating

1. Measure something that is 1 metre. Look at it and remember what 1m looks like.
2. Imagine that as a 1m x 1m square.
3. Imagine that as a cube - a solid shape. VISUALISE IT.
4. If that was concrete ($1m^3$) could you lift it? Could you put it in a wheelbarrow?
5. If it was in the form of a slab for a shed, imagine it. It would not be 1m thick. It would be wider and longer, but it would still be $1m^3$ of concrete.

Formula

Volume	=	L	x	B	x	T	(for thickness)
V	=	L	x	B	x	H	(for height)
V	=	L	x	B	x	D	(for depth)

N.B. All forms are used in C & J.

VOLUME (cont.)

Example 1. Garden Shed Slab

3m x 2m garden shed

125mm slab thickness

$V = L \times B \times T$

$V = 3 \times 2 \times 0.125$

$V = 0.75m^3$

Exercises: Find the volume in m^3 of the following slabs

1. 4m x 5m
   125mm thickness
2. 6m x 2.5m
   110mm thickness
3. 3.5m x 4m
   150mm thickness

ORDERING CONCRETE

Concrete can only be ordered in 0.2 m^3

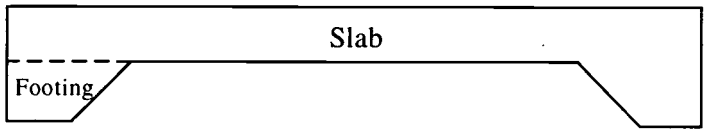
Examples

1. Volume = $4.35m^3$
   You cannot order $.35m^3$
   You must take it to the next $.2m^3$
   i.e. You must order $4.4m^3$
2. Volume = $1.25m^3$
   You must order $1.4m^3$
3. Volume = $3.18m^3$
   You must order $3.2m^3$.

VOLUME (cont.)

Footings

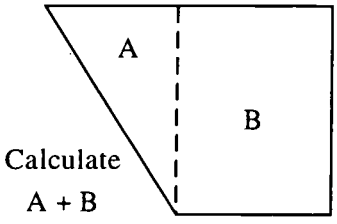
Cross section view of slab and footings.

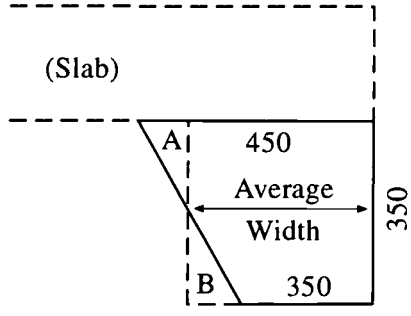


45° angle to prevent cracking 'Sheer Stress'

Calculating volume for footings:

Textbook Method:





Alternative method:

1. A is equal to B

   If we cut A off and place it where B is, it would make a rectangle. (See model)

2. Average width is (450 + 350) ÷ 2 = 400mm

3. Depth is 350mm

4. Volume = Width x Depth x Length of the footing

   = 400 x 300 x Length of the footing

5. Length of footing is calculated using the IN-TO-OVER method (See p. 100).

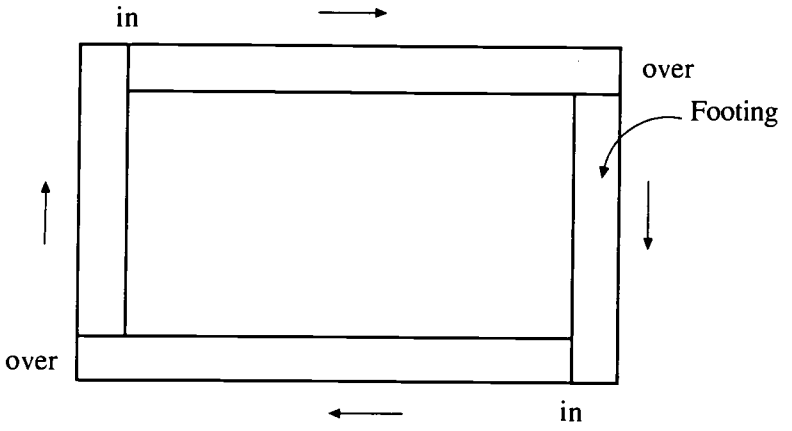
VOLUME (cont.)

Footings

- It is necessary to work out the volume of footings, so that this can be added to the volume of a slab for a cottage.
- It is necessary to work out the length of the footings and then this is multiplied by their width and depth.
- Footing widths for the various types of construction (e.g. brick veneer, timber or fibro) are given in the Standards Book which all apprentices have.
- Depth varies between 300mm and 500mm
- To work out the total length of the footings use a method called

IN-TO-OVER

- This method is used so that you don't calculate corners twice.



- Arrow direction identifies which section is being calculated.
- Move in a clockwise direction.

Method: → Calculations for this length

↓ Calculations for this length

← Calculations for this length

↑ Calculations for this length

Variations

A variation of the above would be to estimate then measure out the slab for the shed on the classroom floor. You could also move outside the classroom and look at a pathway. Pathways are usually 110 to 125 mm thick. You could estimate the length of path you would get from one cubic metre of concrete. One way to do this would be to imagine the block of concrete like a loaf of bread, and estimate how many slices 125mm thick you would get in the cubic metre. You could use a model to show the process.

Further Examples

Decimals

Linking decimals to measurement is a very useful way to develop understanding of decimal place value. If students can visualise a length of 5mm they are unlikely to write it as 0.5m knowing that to be half a metre.

Area

Area is used in Carpentry and Joinery to work out:

- area of paths to know how many pavers to order;
- area of platform flooring for a cottage; and
- area of a slab to work out the volume of concrete.

Method

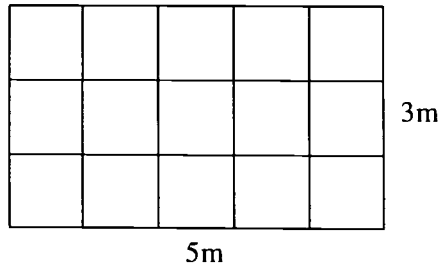
1. Break up the shape into known shapes.
2. Visualise what 1m squared looks like—relate it to something you know.
3. Does the answer look right—is the decimal point in the correct place?
4. Estimate—if the answer is not close to your estimation, check your calculation.

Example

Area of a rectangle is length x breadth (or width)

1. Look at Figure 13.

Figure 13: Area of a rectangle



2. Count the number of squares.

3. Each square is 1m x 1m so each small square is $1m^2$.

4. There are 15 squares so the total area is $15m^2$.

Strategy - Use of models

Michael Keating describes a strategy he uses in Carpentry and Joinery and Floor and Wall Tiling to assist students to move between two and three dimensions.

Models are a visual tool to help students deal with interpreting a three dimensional problem on a two dimensional page. They do not have to be sophisticated. They can be made out of paper, cardboard, wood, polystyrene etc. To be effective, models must present visual information clearly.

A common problem faced by vocational students is relating theory to practice, the abstract to the concrete, and vice versa. Often the theoretical part of a course requires students to make links between the two dimensional representation on a page and the three dimensional reality. Models are one way of helping students make this connection. With models students can look, see, touch, and manoeuvre a concrete representation of a diagram or a construction.

The following examples from Carpentry and Joinery, and Tiling, show how models can be used to demonstrate the application of theory. In Carpentry and Joinery, students have to visualise triangles in the roof and then use descriptive geometry to draw them, in order to measure the angles at which the rafters need to be cut. They have to go through this process of visualising in three dimensions and transferring this to a two dimensional diagram in the theory exams, and in the workshop, or on the job.

There are eight different angles (also known as bevels) used for making cuts on common rafters, creeper rafters, hips and purlins. The angles come from triangles which are created in the roof because of the different angles of the rafters.

Figure 14: Diagram of plan view

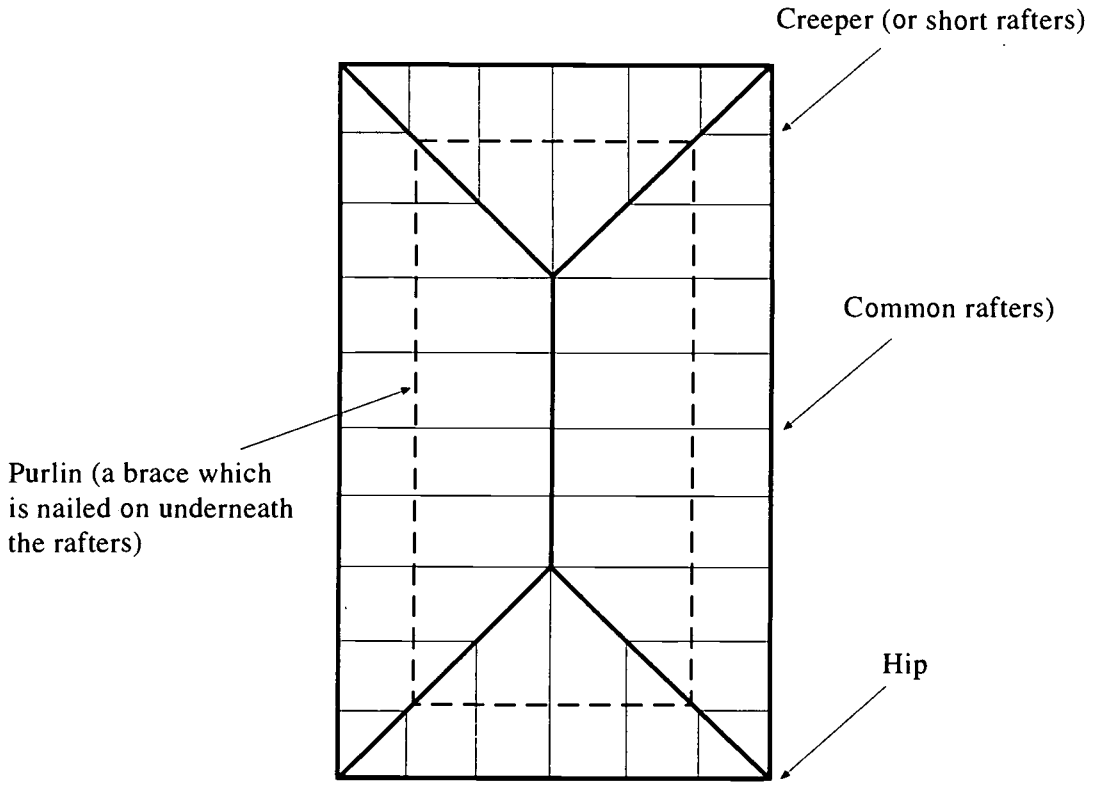
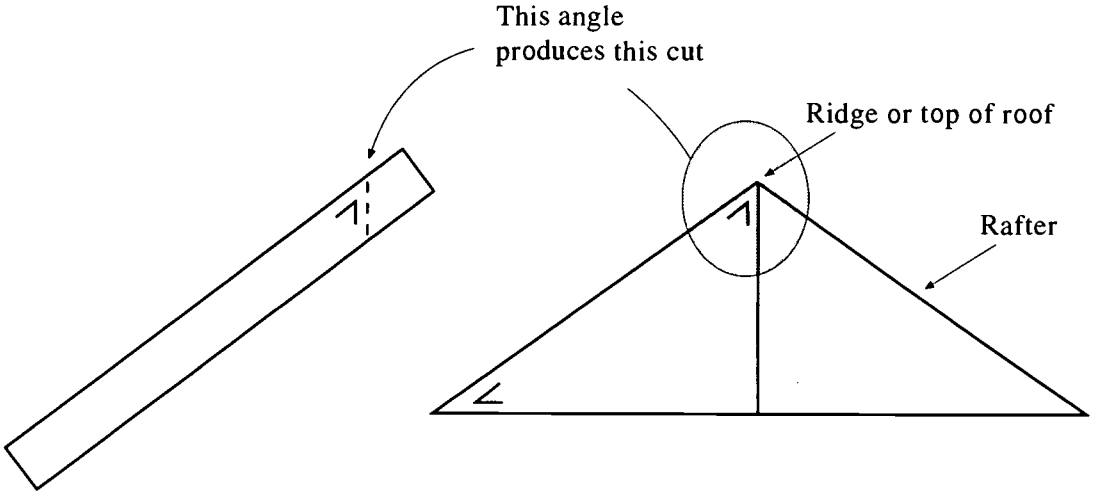


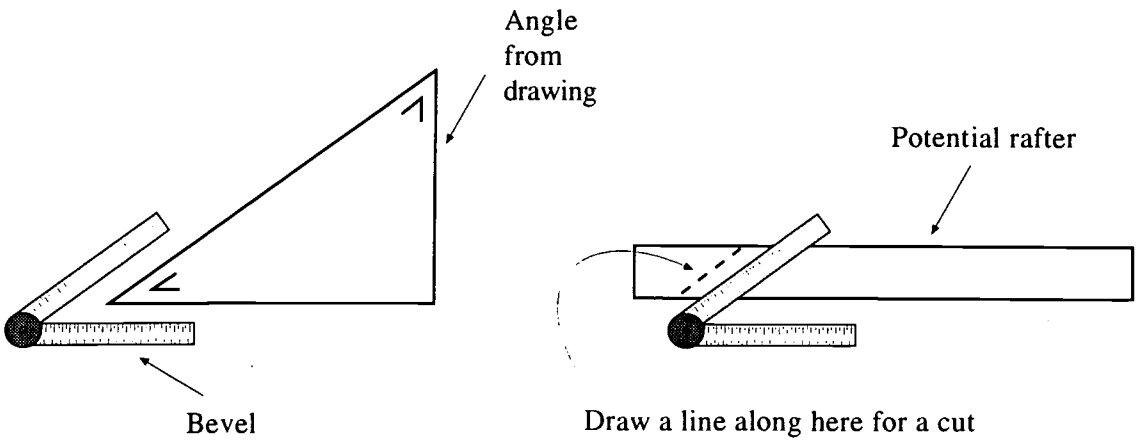
Figure 15: Diagram of elevation–View of roof cut through the middle



The students need to visualise the triangles in the roof and draw them on paper. The triangles in the roof are in a different plane to those drawn on paper. Using a fold-out cardboard model of the roof, students are better able to identify angles within the roof, and keep track of them as they are manipulated onto the plane of the drawing paper. (See Figure 17)

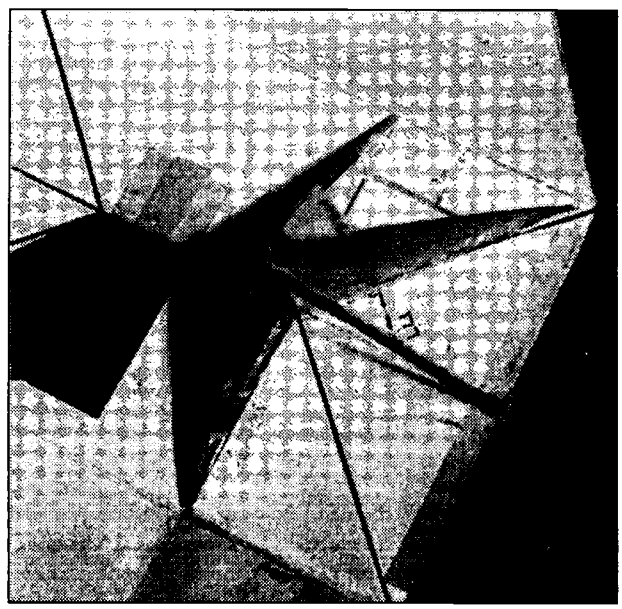
Students need to draw the diagrams in exams, and in the workshop or on the job. In the latter, they work from the diagrams to cut the required angle on the rafter. Using a tool with two adjustable arms called a Bevel, they adjust the Bevel to match the angle created on their drawing, and then reproduce the angle on the piece of wood they are cutting to be a rafter.

Figure 16: Bevel and rafter



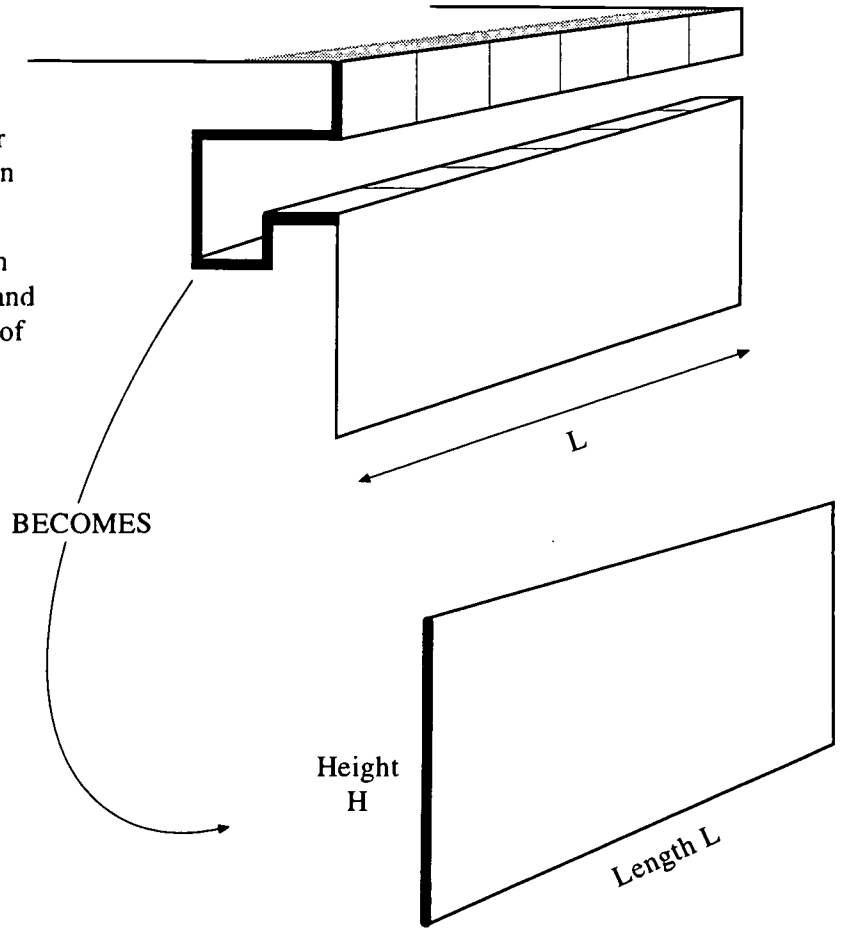
Using a model, sides of the roof can be folded out, making it possible to see the triangle created by the rafter, from which the bevel (angle) is taken. Some triangles produce two angles for bevels, and colour coding helps the students keep track of them.

Figure 17: Model of roof



In Tiling, complex surface areas often need to be calculated to find the quantity of tiles required. A model can show students how these surface areas can 'fold out' to be just one rectangle, for example, the scum gutter for a swimming pool.

Figure 18: Scum gutter



The thick line in Figure 18, represents the linear measurement of the tiles in the scum gutter. When the model folds out, this can be turned into a height and used to calculate the area of tiles required. This emphasises to students the importance of keeping track of linear measurement.

Cardboard cutouts are also effective in simplifying area. The illustrations in Figure 19 show how the two sides of an Olympic pool (trapezium) become a rectangle.

Figure 19: The two sides of an Olympic pool (trapezium) become a rectangle

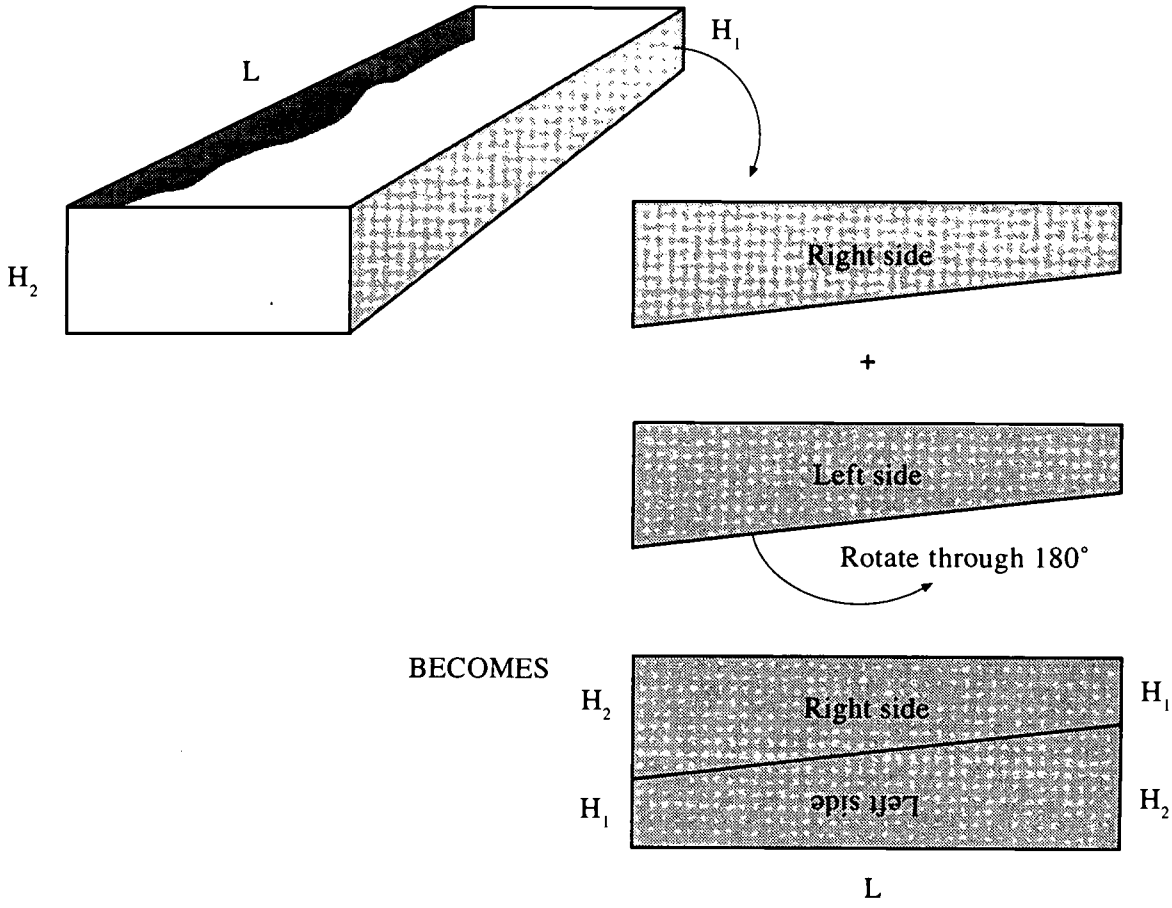


Figure 20: The dado wall running alongside a staircase

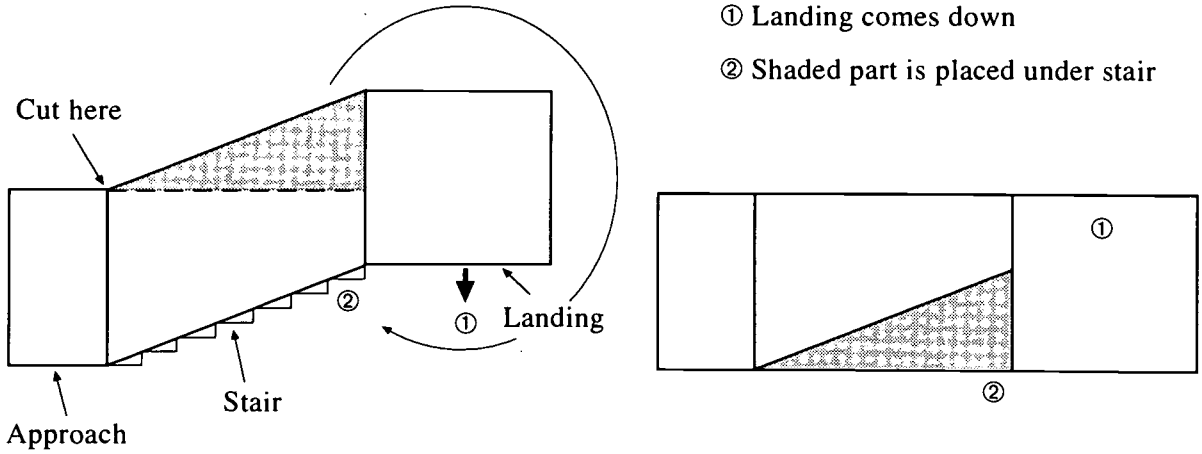


Figure 20 shows how the dado wall running alongside a staircase becomes a rectangle.

Strategy - Understanding and using formulae

In this section John Nichols describes a strategy he has used with Electrical Trade students.

Introduction

This strategy provides a way in which students can learn to understand and manipulate formulae. It employs technical tools to demonstrate the meaning of the symbols in formulae, and uses of formulae. It gives students the opportunity to manipulate the symbols in a concrete way.

Students often have difficulty remembering the meaning of symbols and relating them to the real world. They need to be able to do this before they can meaningfully use formulae to solve problems.

Procedure

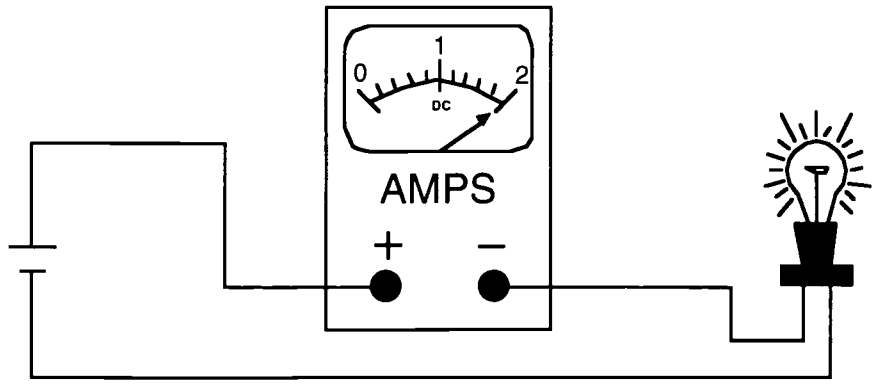
Start with what the students understand and what they need to know. Find out about this by talking to the students. Ask questions to draw out what they know. If students need to build their understanding of the concepts, then this approach is appropriate.

Next use the equipment from the course to set up a situation which builds on students' current understanding, and allows them to explore, in a hands on way and with lots of oral language, the meaning of symbols and terms which they are unclear about. When students have developed some confidence with terminology, they can then use the equipment to explore the relationships between symbols as they are expressed in formulae. While they are clarifying the meaning of symbols and terms, the Tutorial Support teacher can build a summary on the white board, which students can refer back to and copy.

The following example from the Electrical Trade course shows how this can be done, using the basic formula E = IR, in which E is voltage, I is current and R is resistance.

Start by talking to the students about what they understand about the formula. You will be looking for evidence that the students have some understanding that current is the flow of electricity, voltage is the pressure pushing the electricity around, and resistance is about how easy or hard it is for the current to flow. If you find that students need to deepen their understanding of the terms, make a simple circuit using an ammeter, battery or power pack, and a light bulb. (See Figure 21)

Figure 21: Simple circuit



You can discuss where to put the ammeter—in line, where there is a single path for the current to flow, not in parallel, as the current would have a choice of where to flow. Try it the two different ways to see what happens. Only have a very low voltage setting on the power pack when you put the ammeter in parallel with the bulb, otherwise too much current will flow, possibly damaging the ammeter. You can also discuss the two symbols for current, A and I, which can be used interchangeably, the A obviously coming from ammeter, and Amps, the unit of measurement for current.

Take out the ammeter and connect a voltmeter. When you put the voltmeter in the same way as the ammeter, that is, in line, the bulb will not work, which is a good discussion starter. Ask the students why this has happened and someone will probably work out that the voltmeter has a lot of resistance. Discuss how else it could be connected, and try it in parallel and the light will come on again. This is also a good opportunity to talk about the symbols for voltage, V or E, and the unit of measurement, volts. Last century the word 'voltage' had not been coined, and 'electromotive force' was used, hence the E.

Take out the voltmeter and put back the ammeter in series, and the bulb goes slightly duller, showing that the ammeter has a slight resistance. When resistance is discussed, the symbol R can also be used. The other symbol associated with resistance is the symbol for Ohms, Ω, the unit of measurement of resistance. One way of associating it with resistance is to think of it as an extra little loop that the current has to go round, which makes it harder.

All of the above provide students with the opportunity to deepen their understanding of the concepts, to see how the concepts are linked, and to become more familiar with the language and symbols. Clearly best practice would involve the students building the circuits and experiencing the consequences first hand.

The next step is to start using the formula E = IR. It is good at this stage to substitute a known resistance for the bulb, such as a 10Ω resistor. You can build up numerical information from using the equipment, in a table such as Table 2.

Table 2: Calculating voltage

Measured Current I	Known Resistance R	Calculated Voltage V = IR
1A	10R	10V
0.5A	10R	5V
1.2A	10R	12V

Taking the formula as given, and the known resistance as 6, you can measure the current on the ammeter and calculate the voltage. You can then connect the voltmeter and measure it. This helps to break down the mystique of the formula, as the students can see it in action in the circuit. If you use a power pack, rather than a battery, you can change the voltage in the circuit a number of times for practice.

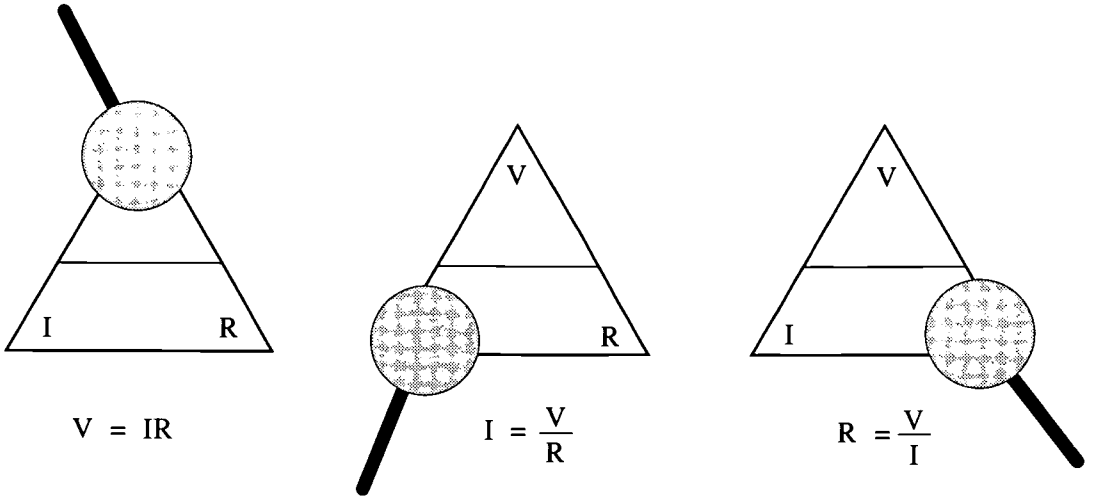
You can also change the given information, and transpose the formula, to calculate resistance or current. (See Table 3.)

Table 3: Calculating current

Measured Voltage V	Known Resistance R	Calculated Current I = V/R
2V	10R	2 ÷ 10 = 0.2A
6V	10R	6 ÷ 10 = 0.6A
8V	10R	8 ÷ 10 = 0.8A
10V	10R	10 ÷ 10 = 1A
12V	10R	12 ÷ 10 = 1.2A

For students who have difficulty with transposition, the following pyramid diagram is a useful tool while they develop their transposition skills.

Figure 22: Transposing a formula - cover method



This approach can be used with a wide variety of other formulae, such as $^1/_f = {}^1/_u + {}^1/_v$ in photography and optical courses, and volumes and dilutions in veterinary science and nursing.

Strategy - Relating new concepts to everyday ideas

Julie Frail describes a strategy she has used with Electrical Trade students.

This strategy helps students come to grips with new concepts by relating them to something with which the students are already familiar. The familiar concept may be unrelated to the vocational context. Often students will have difficulty understanding new concepts, especially if the concept seems to contradict concepts already understood, as in the example below. By relating it to something already known, students have something to hang on to while they develop their understanding of the new concept.

The following example comes from the Electrical Engineering Trade course. This course requires a high level of maths knowledge and some physics.

The different modules in Electrical Trade theory pose different problems for students, despite the fact that the modules are sequenced. The concepts are simple for the trade teacher who is often more concerned with the application of a concept rather than its basic premise. The Tutorial Support teacher must investigate these basic premises. For example in the module that introduces AC principles (NE03), there are several new concepts that the student must come to terms with. There are also simple concepts that are used in slightly different ways which can create problems for some students.

I have found problems arising at the beginning of this module, when students are told to add two numbers. These numbers have special meaning in Electrical Trades theory, in that they have direction as well as length (size).

The activity below has been used to give practical meaning to a way of adding two numbers. The first step is to show students that this new way of adding values is acceptable not only in electrical theory but in everyday situations.

The electrical theory stated below is simplified and not in full context. The Tutorial Support teacher would need to review the theory before attempting this activity. The language in electrical theory is often more complex than the meanings. Students are confronted with new words as well as alternate meanings and usages.

Background

In AC Principles (NE03) students become familiar with three components that will oppose or affect current in some way. These are resistors, inductors and capacitors. Sometimes a combination of these may occur in a given circuit. Students are asked to find the total current flowing through the circuit. The values given cannot be added together in the normal way because each value has a direction as well as a size. This is due to the different effects of the components. The values are not linear.

Many students are unfamiliar with the concept of adding values that are of different direction. They may not understand the concept of linear and non-linear, or how to add values that are non-linear. From a language point of view the extension of the meaning of addition is essential for this module.

The activity below has been designed to take away the fear associated with adding values. It is a concrete way of extending the concept of addition. The activity itself may take 10–15 minutes but is well worth it. It is most effective if the student is allowed to pace out the situation in the classroom, that is walk in one direction and then walk in the new direction, finally asking how far they are from the start.

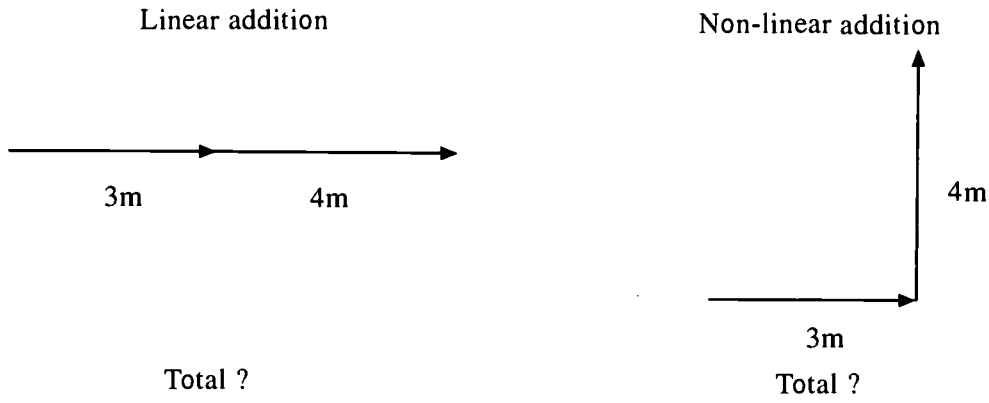
Here is a sample question:

In a parallel AC circuit the resistor has 3 amps flowing through it and the inductor has 4 amps flowing through it. Find the total current flowing in the circuit.

Due to the different effects of the resistor and the inductor, the 3 amps will flow in a horizontal direction and the 4 amps will flow vertically (at 90 degrees). Up until now the students have only dealt with the 3 amps and the 4 amps flowing in the same direction. The sketch below uses the numbers in

the sample question to show the difference between adding linear values and non-linear values.

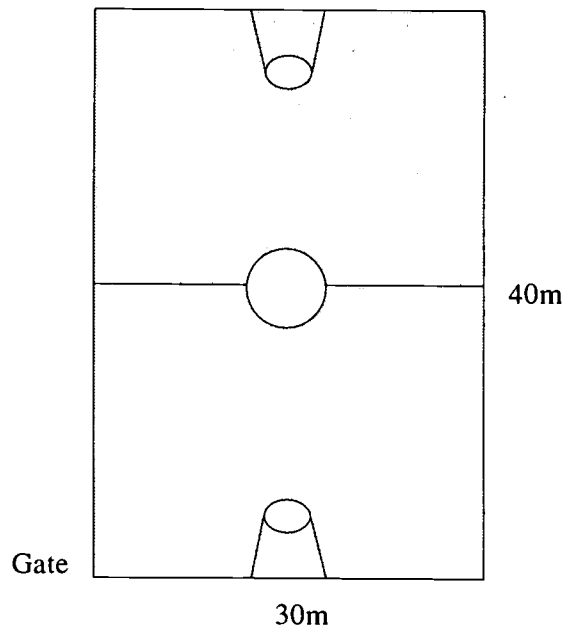
Figure 23: Adding values of components



The initial scenario

The initial idea is developed from a situation where the student enters a basketball match, soccer game etc. The student must get to his or her seat in the opposite corner of the court. The student cannot walk across the court as a game is in progress. The student must walk, say 30 metres in one direction, turn 90 degrees and walk, say 40 metres in the new direction. When the student sits down a friend asks, 'Where is the gate?' or, 'How far are we away from the gate?' Allow the student to answer these questions. In most cases they will tell you that the distance from the gate is the diagonal. In this example the answer is 50m using Pythagoras' theorem. Thus the total of 30m and 40m is not 70m but the length of the diagonal, that is, 50m.

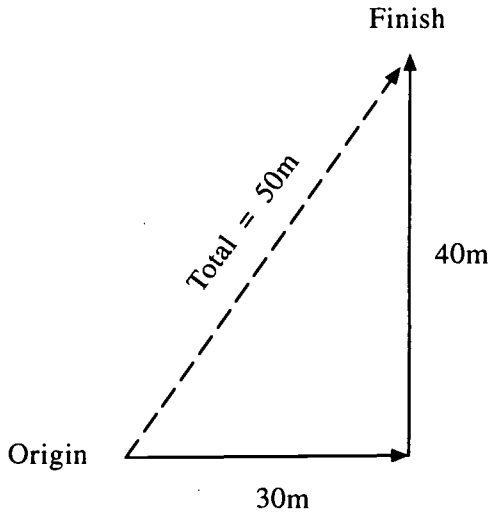
Figure 24: How far is the gate?



Development of the scenario

To develop the concept and introduce the language of the module, the gate becomes the origin, as this is the starting point for finding the seat in the basketball stadium. In figure 25 the black lines show the path taken and the arrows show the direction taken. To find the distance from the origin (gate) to the finish (seat), the diagonal is drawn with the arrow again showing the direction.

Figure 25



Exploring how Formulae are Developed

Sue Hatherly describes an approach she uses with trigonometry in Tutorial Support for students in Engineering Trades.

Introduction

This approach helps students understand the meaning of formulae. It illustrates that formulae are developed from relationships in the real world.

Many students have difficulty choosing and applying formulae. They often see formulae as 'made up' or 'plucked out of the air'. Therefore they have no concept of the meaning of a formula to help them use it. This approach helps them understand how the formula was developed and what it means so they are better able to use it. The aim of the approach is to give them enough understanding to be able to apply formulae sensibly.

Strategy - Exploring how formulae are developed

The following example of this approach uses trigonometry.

Start with looking at right angled triangles. Use straight edges, preferably rulers, to construct triangles rather than draw sketches which then have to be measured. If you use steel rulers which have '0' at the edge, you can read the length of sides easily. Use a protractor to align the rulers at the chosen angles. Using rulers also helps to make the break from school maths where trigonometry was applied to neat drawings with the right angle on the bottom left hand side.

Show that in right angled triangles the following things occur.

- Once you set the size of the first acute angle, the second acute angle is predetermined and they add up to 90°. If you increase one the other will have to be smaller.
- Triangles of all sizes can have the same three angles. This can be shown by sliding out the ruler that forms the hypotenuse. If you want to keep the angles the same all three sides get bigger, that is, the relationship between them stays the same. The easiest to see is in a 45° – 45° – 90° triangle. If you double the length of one side, you have to double the length of the other sides to keep the two 45° angles fixed.
- Conversely, if you want to keep the same relationship between the sides, for example, increase them all by a half, the angles have to stay the same size.

This is what trigonometry is about—this fixed relationship between sides and angles. The mathematical way of expressing this relationship is by a ratio which can be recorded in different ways, for example a three to two ratio can be written 3:2 or 1.5 :1 or just 1.5 on its own. Trigonometric ratios are written in this third way as a single figure with the :1 assumed. Somebody has sat down and worked out the ratios between all combinations of sides for every possible angle. This information was originally written in books of tables and is now stored in scientific calculators.

There are three combinations of sides which are used most of the time, but first of all you have to find a way of naming which side you are talking about. The 'hypotenuse' is easy—it is just a special name for the side opposite the right angle. The other two sides however need to be defined in terms of a particular acute angle.

Check that students are aware of the everyday meaning of 'adjacent' and then explain that the terms 'opposite' and 'adjacent' simply refer to the sides 'opposite the particular angle' or the side 'next to the particular angle'. Show that it is necessary to talk in reference to a particular angle because the one

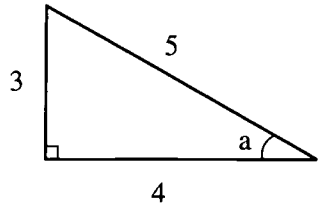
side is 'opposite' one of the acute angles and 'adjacent' to the other. Once this has been established there are three common combinations for any angle and they are written as fractions:

$$\frac{\text{opposite}}{\text{hypotenuse}} = \text{sine (or sin)}$$

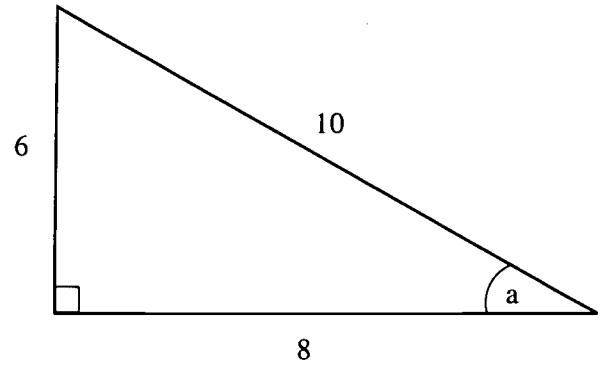
$$\frac{\text{adjacent}}{\text{hypotenuse}} = \text{cosine (or cos)}$$

$$\frac{\text{opposite}}{\text{adjacent}} = \text{tangent (or tan)}$$

The ratios for these three combinations are stored as decimals in a scientific calculator for every possible angle. When you say that the sine ratio of an angle a is 0.6, you literally mean that in order to have that angle included in a triangle, the side opposite that angle would have to be 0.6 x length of the hypotenuse. Two of the many triangles where this happens are:



Example 1



Example 2

In Example 1, the sine of a is $\frac{3}{5}$ = 0.6. Similarly in Example 2, the sine of a is $\frac{6}{10}$ = 0.6.

The angle associated with this ratio is 36°52′ (to the nearest minute). In other words, the only way a right angled triangle with sides 3, 4, and 5 can exit is if it includes an angle of 36°52′. The ratio in Example 2 is the same as in Example 1 because all the sides have simply been doubled. The ratio will remain the same as long as all the sides are increased or decreased by the same factor.

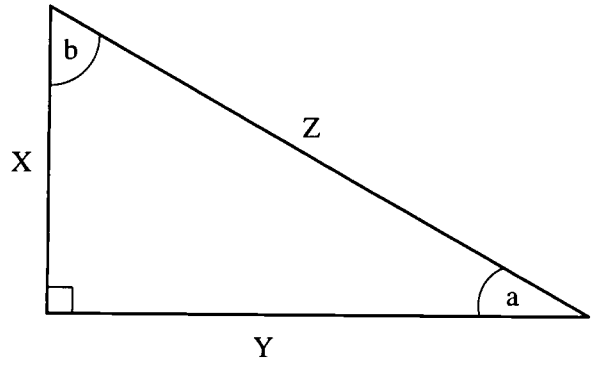
Conversely, every right angled triangle with an angle of 36°52′ (to the nearest minute) must have the side opposite the angle 0.6 the length of the hypotenuse.

Reinforcing the concept

To give students the opportunity to explore and reinforce this concept have them create a number of different right angled triangles. Measure the sides and calculate one of the ratios. They can then measure the angle with a protractor and look up the ratio on their calculator and compare it with their worked out answer. It should be possible to get fairly close to the actual ratio (and have an opportunity to look at decimal place value and approximation if necessary). It can also be an chance to observe their measurement skills.

If you have access to trig tables, they can be a good way of investigating patterns and relationships between the ratios. Students can see that sine and cosine are always less than one (because a side will always be shorter than the hypotenuse) but tangents range from less than one to very large. You can see that the sine of an angle is equal to the cosine of its complementary angle, that is, sin 30° = cos 60° because the side opposite the 30° angle is the side adjacent to the 60°.

For example, take a general right angled triangle with sides X, Y and Z and angles a and b.



$$\sin a = \frac{X}{Z} \qquad \cos b = \frac{X}{Z}$$

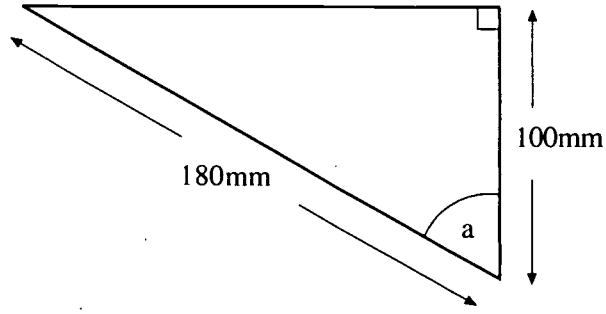
$$\sin b = \frac{Y}{Z} \qquad \cos a = \frac{Y}{Z}$$

Two ways of using trig ratios to solve problems:

- If you know the length of two sides, they can be expressed as a ratio and then you can work out the angle (because if you know the relationship between two sides there is only one possible angle it could be). Once you find this out you can work out the other angle and the length of the third side.

For example:

Find a



Solution:

The first step is to work out what the sides we know are in relation to the angle we want. 180mm is clearly the hypotenuse; 100mm is adjacent to angle a. The trig ratio that involves adjacent and hypotenuse is cosine, so we will find cos a first then the value of a.

$$\cos a = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$= \frac{100}{180}$$

$$= 0.555\dot{}$$

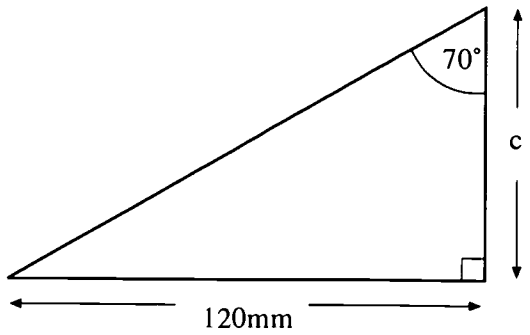
Use $\cos^{-1}$ key on the calculator which tells the calculator the ratio and asks for the angle associated with it (remembering to press the function button first):

$a = 56.251015°$

$= 56°15'$ to the nearest minute

- If you know an angle and the length of one side you can work out the length of the other side by looking up the ratio associated with that angle and using it to work out the other side involved in that particular ratio.

For example:



Find the length of c

Solution:

Again the first step is work out what the known and unknown sides are in relation to the angle. 120mm is opposite the 70° angle, c is adjacent to it. The trig ratio that involves opposite and adjacent is tan, so:

$$\tan 70^\circ = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan 70^\circ = \frac{120}{c}$$

Multiplying both sides of the equation by c:

$$c \times \tan 70^\circ = \frac{120}{c} \times c$$

$$c \times \tan 70^\circ = 120$$

Dividing both sides of the equation by tan 70°

$$\frac{c \times \tan 70^\circ}{\tan 70^\circ} = \frac{120}{\tan 70^\circ}$$

$$c = \frac{120}{\tan 70^\circ}$$

$$= 43.676428$$

$$= 44\text{mm to the nearest millimetre}$$

Which ratio you choose depends on which sides or which side and angle you already know—a bit like a puzzle.

From here you need to work through lots of examples of all possible combinations, perhaps at first just identifying which ratio is appropriate.

Applications

In Engineering Science, trigonometry is used to find angles that cannot be physically measured in components. (e.g. p 36 NBB 13 Engineering Science). The additional skill here is to identify the right angled triangle that will allow you to work out the angle needed. The triangle may be very long and thin and therefore not like right angled triangles the students have been used to working with. Also, when the triangle has been identified it may give only half the angle sought and the answer will need to be doubled. Students will need lots of practice in identifying the appropriate triangles and making use of the dimensions given. This is best explored in a team teaching situation making use of the vocational teacher's technical knowledge.

SECTION 5

REFERENCES AND APPENDICES

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Appendix A–Sample Literacy and Numeracy Screens

Following is a literacy screen devised by Stephen Black specifically for Fine Art students. 'Cultural Productions' is the most demanding subject in terms of literacy for students in the Advanced Diploma of Fine Art. Students are expected to read widely when researching for their essays and the text used is typical of those found in art books. For this screen, students are given a copy of a painting by William Dobell (Portrait of an Artist) and an extract from an art book (Smith, B. 1971. pp 264-266). They are asked to read it and then answer four questions.

The tasks in this screen attempt to assess particular underpinning skills that students need in order to complete their written assessments. Although the screen does not require a complete essay from the students it does give a rough indication of their competence in writing certain text types. It also indicates how effectively they can read for a purpose, scan and read for detail as well as understand different question types. An analysis of what each question is looking for is shown on the screen which follows.

Student's Name _____

Course _____

Read through the article on William Dobell and answer the following questions

1. In your own words, describe the physical features and the expression of Dobell's subject Joshua Smith.

   Expressing a personal response to and interpretation of an artwork. (Text type: Description/ Personal Response/Interpretation)

2. Why did the painting cause so much controversy?

   Summarising information from written texts. Interpreting, recounting and giving opinions. (Text type: Exposition)

3. Why do you think that the painting was described as a 'biological absurdity' by one of the critics?

   Interpreting and extrapolating beyond the written text and expressing an opinion. (Text type: Interpretation)

4. What arguments did the art critic from the Sydney Morning Herald provide to support Dobell in the court case?

   Reading for detail. (Text type: recount)

Following is a numeracy screen devised by Laurinda Allan for Mechanical Engineering trade students. After discussions with Mechanical Engineering teachers, the items selected were considered appropriate to assess the foundation skills assumed by this particular course.

Mechanical Engineering – Trade

Name _____

Date _____

We want you to do the following exercises to see if you need any extra help with some of your trade theory.

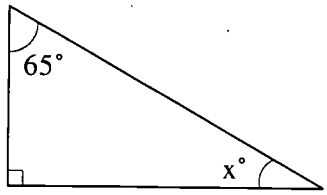
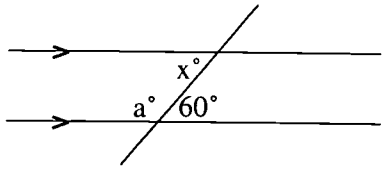
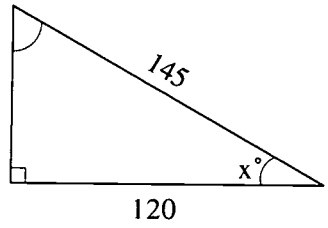
You can use a calculator.

Time Started _____

Time finished _____

Comments _____

Question	Answer
$0.9 + 0.3 =$	
$4.13 + 2.307 + 7 =$	
$1 - 0.01 =$	
$44.6 - 3.06 =$	
$2.3 \times 0.6 =$	
$0.2 \times 300 =$	
$150 \div 1.57 =$	
$\frac{1}{4} + \frac{1}{8} =$	
$\frac{3}{10} - \frac{1}{5} =$	
$\frac{3}{4} \times \frac{4}{10} =$	
$\frac{3}{8} \div \frac{1}{4} =$	
$2\frac{7}{8} + 1\frac{1}{16} + \frac{3}{32} =$	
$5^2 =$	
$\sqrt{36} =$	
A machine operator is to manufacture steel pins which take him an average of 2.75 minutes per pin. He works a $7\frac{1}{2}$ hours shift. How many pins would he make in 5 working days? Show all working.	

Question	Answer
Round 0.1685 to two decimal places	
	x =
	a = x =
sine = $\frac{\text{opposite}}{\text{hypotenuse}}$ cosine = $\frac{\text{adjacent}}{\text{hypotenuse}}$ tangent = $\frac{\text{opposite}}{\text{adjacent}}$ 	x =
a = $\frac{c}{b}$ Make b the subject	
x + a = 7 Make x the subject	
5x + 4y = 100 Make y the subject	
z + $\frac{h}{t}$ = p Make z the subject	
Change $\frac{5}{8}$ to a decimal	
Find 15% of $60	
Did you use a calculator?	

1. How do you feel about maths? (Please circle.)

   A. Love it

   B. Like it

   C. Don't like it

   D. OK

   E. Like it sometimes

   F. Hate it

2. What do you like about maths

3. What don't you like about maths

Appendix B: Skills Checklist

The following list may be useful when assessing a student or determining the language, literacy, numeracy and study requirements for a course. It is not an exhaustive list and includes skills that might be considered 'thinking skills'.

Skills Checklist

- ☐ Analyse and interpret text
- ☐ Ask questions
- ☐ Categorise information
- ☐ Check
- ☐ Clarify purpose of task
- ☐ Classify
- ☐ Critically reflect
- ☐ Deliver oral presentations
- ☐ Discriminate and visualise information
- ☐ Discuss issues and topics
- ☐ Draw diagrams
- ☐ Estimate
- ☐ Express opinions in spoken and/or written language
- ☐ Interpret assessment questions
- ☐ Interpret graphs, charts, diagrams, drawings
- ☐ Link and apply theory to a practical application
- ☐ Memorise
- ☐ Observe detail
- ☐ Produce study notes
- ☐ Record observations
- ☐ Relate text to diagrams and vice versa
- ☐ Research a topic
- ☐ Scan
- ☐ Seek clarification of written instructions for assessment tasks, assignments and competency tests

Skills Checklist (cont.)

- ☐ Sequence
- ☐ Skim
- ☐ Solve problems
- ☐ Summarise
- ☐ Take notes (from oral or written texts)
- ☐ Use a calculator
- ☐ Use alphabetical order
- ☐ Use an index
- ☐ Use and understand technical vocabulary or trade terms
- ☐ Use cross referencing
- ☐ Use interpersonal and social skills
- ☐ Use entry level maths assumed by course
- ☐ Write essays
- ☐ Write reports
- ☐ Write instructions, procedures, explanations, descriptions etc.

Please add extra skills

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Appendix C: Curriculum Support Documents

Bookeeping – Accounts Receivable 7365UB

Delivery

The following section is to assist vocational teachers/workplace trainers by making more visible the particular kind of speaking, listening, reading, writing and numeracy required to successfully complete this module.

This section might be used by teachers/trainers to:

- alert them to likely areas of skill development
- inform their own teaching practice
- negotiate for specific language, literacy or numeracy team teaching
- inform discussions with ESOL/ABE personnel.

The particular kinds of speaking, listening, reading, writing and numeracy are called 'texts'.

'Texts' are not textbooks.

Column 1: Lists these texts.
Column 2: States where, in the module these texts may be involved.
Column 3: Provides some strategies for learners to approach these texts.

This module requires the following language, literacy and numeracy skills:

Speaking/Listening

Texts	Learning Outcomes	Strategies
• verbal report • verbal suggestions • verbal instructions	3.2, 3.3 3.5, 3.2 3.4	• identify main points for inclusion in report • sequencing information logically • listening for key words/concept • clarifying instructions • giving and interpreting feedback • use appropriate language style in resolving or referring credit enquiries • effective question techniques

Writing

Texts	Learning Outcomes	Strategies
• sales journal	1.1	• identify purpose of writing task
• sales return journal	1.2	
• cash receipts journal	1.3	• using completed successful examples of journal entries, ledgers, balances, documentation
• general journal entries	1.4	
• account receivable ledger	2.1	
• list of debtors' balances	2.2	
• debtor documentation	3.2	• predicting what each journal entry needs to contain

Reading

Texts	Learning Outcomes	Strategies
• source documents - sales invoices - credit notes - receipts - general source documents	1.1 1.2 1.3 1.4	• sequencing and categorising documents • skimming titles/headings/column headings to identify relevant sections of sales invoices, credit notes, receipts, journals
• journal including - cash receipts - sales journal - sales returns - general journals	2.1	• using layout features to identify relevant sections • scanning for particular details

Numeracy

Texts	Learning Outcomes	Strategies
• debtors' balance	2.2	• calculator - simple operation - decimals
• statements for debtors	3.1	• checking for accuracy using estimate/reasonableness • use of calculators - sequencing

Destination & Products–Regional Australia–Module BTR22

Delivery

The following section is to assist vocational teachers/workplace trainers by making more visible the particular kinds of speaking, listening, reading, writing and numeracy required to successfully complete this module.

This section might be used by teachers/trainers to:

- alert them to likely areas of skill development
- inform their own teaching practice
- negotiate for specific language, literacy or numeracy team teaching
- inform discussions with ESOL/ABE personnel.

The particular kinds of speaking, listening, reading, writing and numeracy are called 'texts'.

'Texts' are not textbooks.

Column 1: Lists these texts.
Column 2: States where, in the module these texts may be involved.
Column 3: Provides some strategies for learners to approach these texts.

Generic Terminology:

1. model – to 'model' is to show, display, give or demonstrate good examples of a type of activity and discuss its stages and/or characteristics e.g. you can model or show a clear written assignment, a way of speaking to suit the occasion, a graph or diagram as a way of showing and retrieving information etc.
2. mind mapping – a creative pattern of connected ideas used to recall what you know, generate new ideas and demonstrate 'gaps' of knowledge for further research. Generally start with the question, main topic or idea enclosed in the centre of the page. Using coloured pens, add branches to hold the important points, add details and key words onto the branches and draw symbols and/or pictures for better recall. Can also be used by teachers as a planning tool for lessons.

Speaking/Listening

Texts	Learning Outcomes	Strategies
1. Discussion	All LO's	1. Encourage and assist students to express an opinion; to recall, share and compare past experiences. Model and promote ways of expressing interest, maintaining conversational flow, giving feedback and taking turns
2. Oral presentation	LO's 1 & 2	2. Use good language models of presenting clear, unambiguous information about a specific region in Australia in response to client questions. Demonstrate the stages or steps appropriate to an oral presentation in this context.
3. Oral test questions	LO's 2. 3 & 4	3. Students could devise their own questions for self and peer testing based on typical test questions
4. Role play/simulations	LO's 3 & 4	4. Practise role plays/simulations in small groups demonstrating the required competencies. Could use peer assessment. Use good language models including taped interaction and videos.
5. Telephone skills	LO 1.2	5. Role play in class steps in making telephone requests for information eg. polite greeting, self identification, reason for request, etc. Students then use these skills as part of gathering information. Use authentic taped or video material where possible.
6. Listening and questioning techniques for communicating with clients	LO 3.1	6. Demonstrate and role play reflective listening skills, asking questions to clarify the client's needs and interests, checking and restating client needs.

Writing

Texts	Learning Outcomes	Strategies
1. Notetaking - from lessons - from handouts - from information texts	All LO's	1. Model what is required, discuss strategies for effective note taking e.g. skimming, scanning, identifying the main points, using dot or numeric points, using clear headings to subdivide information etc. Model how to summarise the researched material.
2. Resource file of relevant material	All LO's & assessment	2. Demonstrate and discuss possible types of filing systems and ways of classifying information. This may include writing Information Reports.
3. Information reports	LO's 1, 2, 3 & 4	3. Model this kind of writing e.g. There are a number of factors to consider when delivering information. These are; 1)... 2)... 3)...
4. Evaluation	LO 4.2	4. Model evaluation e.g. These travel products and services are recommended for these customer types because: Product or service 1) ... 2) ... 3) ...
5. Letters of request	LO 1.2	5. Model appropriate layout steps/stages/language for this type of letter and show successful examples authentic to the industry.

Reading

Texts	Learning Outcomes	Strategies
1. Accessing, researching information and summarising e.g. pamphlets, guide books, information texts.	All LO's	1. Accessing information, researching and summarising skills should be taught to the whole group at the beginning of this module as they are needed for all outcomes. This includes skimming and scanning techniques. Discuss the way layout and format in these text types helps you locate information.
2. Lecture notes/handouts	All LO's	2. Clear and concise handouts, use plain English principles. Explain specialist terminology or difficult words. Assist learners to identify the purpose of a text or written assessment task. Model and encourage active engagement with written test eg. highlighting to foreground crucial information. Colour to distinguish categories of information.
3. Board and OHT notes and diagrams	All LO's	3. Neat, logically structured board notes and diagrams; essential information only.
4. Assessment tasks	All LO's	4. Read, explain, clarify, show models of appropriate assessment tasks.

Numeracy

Texts	Module Section	Strategies
1. Locating destinations on maps	Outcomes 2, 3 & 4	1. Provide opportunities for students to investigate the properties of authentic and representational maps, including key, scale, compass points, grids for locating destinations. Model finding specific locations on maps and showing how to get to them.
2. Reading and interpreting climate/season/ weather charts	Outcomes 2, 3 & 4	2. Encourage students to read climate and weather charts critically. Ask questions to draw out judgments about temperatures and suitability of time of year for particular tourist activities (e.g. season/time of year most appropriate for skiing, water sports etc).
3. Reading and interpreting calendar, tour and festival dates	Outcomes 2, 3 & 4	3. Model reading calendars, determining when tours and festivals begin and finish, how many days/weeks they cover etc.
4. Reading and interpreting tables of fares and charges. Determining different rates according to peak/low/ off season; and child/adult/concessions	Outcomes 2, 3 & 4	4. Provide opportunities for students to examine features of these tables, including different pricing categories such as peak, low and off season, child, adult and concession rates etc.

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