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Competency based assessment in the professions

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Competency-based Assessment in the Professions

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Competency-Based Assessment in the Professions

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Doug McCurry
Australian Council for Educational Research

National Office of Overseas Skills Recognition
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FOREWORD

I am pleased to be able to launch this valuable paper on competency-based assessment in the professions. The paper complements its companion paper Establishing Competency-based Standards in the Professions and is a fitting successor to it in the Research Paper series being produced by the National Office of Overseas Skills Recognition (NOOSR).

The development of competency-based standards and associated assessment tools within the professions were important parts of the Government's migrant skills reform strategy, which I outlined in my policy statement Migrant Skills: Improving Recognition Processes just over a year ago. NOOSR has a central role within that strategy to encourage the development of competency standards in the professions. Developing assessment methods are a crucial aspect of the full implementation of competency standards.

This paper by Dr Geofferey Masters and Mr Doug McCurry of the Australian Council for Educational Research discusses a range of possible approaches to competency assessment. The paper's consideration of wider issues associated with competency-based assessment and of the advantages and disadvantages of various assessment approaches will be most helpful to those seeking fully to implement competency standards in the professions.

John Dawkins
Minister for Employment, Education and Training
December 1990

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PART I. OVERVIEW

In May 1990 the National Office of Overseas Skills Recognition (NOOSR) commissioned the Australian Council for Educational Research (ACER) to prepare a paper on the implementation of competency-based assessment in the professions. The purpose of this paper is:

- to assist professions to develop, in conjunction with NOOSR, the most suitable methods of assessing individuals against national competency standards;

- to provide advice on assessment methods likely to be practical and useful for the professions generally; and

- to provide advice on assessment methods consistent with the Commonwealth Government's principles for the reform of the overseas skills recognition process.

In preparing recommendations on suitable methods of assessment, we have found it necessary to begin with a consideration of the kinds of ***competencies*** (types of skill, knowledge and attitudes) that are likely to form the basis of national competency standards in the professions. We have also had to consider how ***standards*** (minimum acceptable performance levels) are likely to be specified. In our opinion, these two considerations--the kinds of competencies to be assessed in a profession and the way in which minimum standards are to be specified--are key determinants of appropriate methods of assessment.

In Part II of our paper, which has been written in consultation with the authors of a companion paper, *'Establishing Competency-based Standards for the Professions'*, we consider alternative ways of conceptualising occupational competence and show how different conceptualisations can have very different implications for assessment. We briefly review the notion of competency-based assessment. What are its distinguishing characteristics? How is it different from current practice?

Our review of previous attempts to implement competency-based assessment reveals that these attempts have often been associated with detailed checklists of occupational skills. The purpose of assessment under this approach is to establish whether or not each listed skill has been mastered. We conclude that a narrow, behaviouristic approach of this kind is unlikely to be appropriate for defining and assessing professional competence, and recommend instead an approach to competency-based assessment in the professions based on realistic, complex workplace problems.

In Part III we address the question of standards and show how the approach taken to defining standards in an occupation also influences the choice of an assessment method. When occupational competence is defined and assessed in terms of a list of observable skills, each skill usually suggests an appropriate assessment task, and the 'standard' for each skill is simply the required level of performance on that task.

We believe that standard setting of this kind is unlikely to be appropriate for most areas of professional practice. In consultation with the authors of the companion paper, we recommend setting standards for broadly-defined areas of professional competence. Central to our recommendation is the concept of *levels of competence* and of *progression* between levels. We recommend that, within broadly-defined areas of professional practice, assessment procedures be developed to:

- infer an individual's current level of competence;
- decide whether this level satisfies some pre-determined standard; and
- provide feedback to assist in that person's further professional development.

Standards of the kind we recommend are not worded as precisely as criteria for the satisfactory performance of narrowly-defined tasks. Nor do they pretend to be as precise as 'passing' scores on paper and pencil examinations. In general, we believe that precise standards will be less appropriate in the professions than standards which depend on a degree of professional judgement. Nevertheless, there is much that can be done to facilitate the standard-setting process and to make standards in the professions as explicit as possible.

In Part IV we take up some general issues associated with the assessment of professional competence by listing and discussing a variety of assessment methods likely to be useful for assessing a range of competencies in the professions. We discuss possible applications of these methods and outline issues of validity and reliability that arise in their implementation. We suggest that a move towards competency-based assessment will usually involve a broadening of the range of methods used in the professions. A greater emphasis on the assessment of workplace skills rather than theoretical knowledge will imply a greater use of more direct assessment methods based on realistic professional tasks, and less use of relatively indirect methods such as paper and pencil tests.

In Part V we discuss issues concerned with designing and implementing a competency-based assessment system, including special issues that arise in the assessment of professionals trained overseas.

PART II. CONCEPTUALISING OCCUPATIONAL COMPETENCE: IMPLICATIONS FOR ASSESSMENT

Procedures for assessing occupational competence take on a very important role over time: they provide a public statement of what it means to be competent in an occupation. Over time, they provide an operational definition of occupational competence that in practice becomes more important than statements such as described 'standards' for an occupation. For this reason, careful attention must be given to the way in which competence is conceptualised and operationalised in assessment procedures.

Mitchell and Cuthbert (1989), in their evaluation of recent competency testing practice in Scotland, stress the importance of the relationship between assessment procedures and the conceptualisation of competence they reflect:

> The need for clear conceptualisations of competence is necessary as it is competence which occupational standards are meant to describe. Competency tests tend at present to assess the tangible, routinised task skills of a particular occupation or job category rather than any of the 'softer' aspects of competence such as the ability to manage a number of tasks at once or the ability to deal with customers or clients, or to deal with contingencies... As competency testing seems to have been taken on board as the only possible means of assessing performance in many cases (rather than one amongst a variety of methods), it is difficult to evaluate whether the form of assessment has driven the notion of competence or vice versa.
>
> (Mitchell and Cuthbert, in *Insufficient Evidence?*, 1989)

The companion paper to the present paper addresses the question of how competence in professions might be conceptualised and describes a variety of procedures that can be used by a profession to analyse professional tasks, roles and attributes. In this section we show how different ways of conceptualising professional competence can have different implications for the choice of assessment methods. We begin with a review of some of the ways in which competency-based assessment has been interpreted and implemented in the past, and end with some recommendations for the assessment of broadly-based professional competencies.

2.1 Some Background to 'Competency-Based' Assessment

Calls for the introduction of 'competency-based' approaches to training and assessment in Australia have arisen in part from a view that the requirements of formal education and training programs are often based more on theory and tradition than on the demands of the workplace:

> Training for many occupations is conducted in universities and colleges where the standards set often have more to do with educational or scholarly performance than performance as an engineer or doctor or accountant. It is in this context that the idea of 'competency assessment' has grown up.
> (Ashenden, in *Employment and Skill Formation Council: The Recognition of Vocational Training and Learning*, 1990)

Competency-based assessment is being promoted as an approach to establishing occupationally-relevant standards of competence. The emphasis is on demonstrated competence in the skills important to an occupation. The ability to demonstrate these skills is usually considered more important than the time a person has spent in formal training. The emphasis on demonstrated competence is considered to have the added advantage of recognising skills irrespective of where and how they were acquired, including skills developed in the workplace that may not be reflected in paper qualifications.

An important element of the competency-based movement is the attempt to make explicit the skill standards necessary for competent practice. Through explicit skill standards, education/training goals are made more obvious to students/trainees, areas in which remedial action is required can be identified, and the specific competencies of persons without formal qualifications can be established and recognised.

Competency-based professional programs have a long history in the United States. Olesen (1979) reviewed a number of U.S. competency-based programs in Nursing, Law and Pharmacy and reported that they were all characterised by the precise specification and articulation of competencies associated with professional practice. The certification of students in these programs was based on an assessment of their mastery of these specified elements of professional competence.

The competency-based movement has also had an impact on trade training in some parts of the world. In the UK, for example, the New Training Initiative of the Manpower Services Commission (1981) recommended that standards of competence should be set for each occupational area based on identified work roles, and that these skill standards should in the future underpin vocational qualifications.

In Australia, competency-based training and assessment is seen by the Commonwealth Government as an important element in the restructuring of industrial awards. This restructuring presumes that competencies will be defined and assessed in a range of occupations:

> Competency-based trade training requires the identification of all the skills involved in an occupation and of the specific mix of skills, knowledge and attitudes required for recognition in a specific occupation; mechanisms to achieve those skills; and methods of assessment and certification on attainment of those skills.
> (Report of the DOLAC Working Party on Competency-Based Trade Training, 1989)

To set national skill standards, the Commonwealth Government has established the National Training Board (NTB):

> The National Training Board (NTB) will, in consultation with industry, set national skill standards for occupations from entry to para-professional level covered by industrial agreements. These standards will provide the benchmarks for curriculum development, accreditation of training programs and certification of individuals' skills... National skill standards identify the core skills needed for the performance of fundamental tasks required in the everyday practice of a given occupation, and the level of competence necessary to adequately discharge those tasks. These would be applied regardless of where the individual has gained his or her training ... The development and adoption of national skill standards has the potential to... increase the emphasis placed by recognising authorities on a person's actual skills rather than just on his or her formal qualifications.
> (Dawkins, 1989, 17-18)

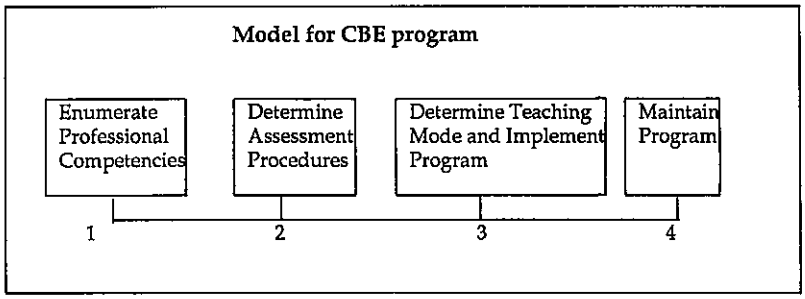
A review of recent Commonwealth Government documents suggests that the system of competency-based assessment envisaged for the professions will involve:

- a review of what professionals do in their work;
- a description of clear and appropriate competency standards;
- a direct assessment of performance with an emphasis on demonstrated skills and knowledge; and
- a comparison of performance with described competency standards.

An example of work in progress to develop competency-based assessment in the professions is the work being done to describe and assess competencies in Pharmacy in Western Australia (see Figure 1). The approach being taken in Western Australia begins with an analysis of professional tasks/roles in Pharmacy to identify a set of Major Groups of Competencies. In Figure 1, twelve Major Groups are identified. For each of these groups, a list of detailed competencies is then developed.

FIGURE 1: COMPETENCY-BASED EDUCATION IN PHARMACY

Source: David and McDonald, 1989



Major Groups of Competencies

1 Dispensing
2 Over-the-counter sales of medicines
3 Ward services
4 Manufacture and packaging
5 Sterile manufacturing and aseptic dispensing
6 Drug and toxic substances information
7 Health-related activities
8 Professional development
9 Personnel
10 Finance and capital investment
11 Marketing
12 Industrial pharmacy

* = Competency to be achieved by end of:
* March
** June
*** September

FIGURE 1: COMPETENCY-BASED EDUCATION IN PHARMACY CONTINUED

Details of the Dispensing Competencies

General statement

The graduate trainee should have the ability to maintain an efficient and accurate dispensing procedure in response to prescriptions and requests by patients.

The graduate trainee should achieve a high degree of competence in the areas outlined in Paragraph A and a basic degree of competence in the areas outlined in Paragraph B.

A The graduate trainee should be able to:

- * 1 organise a systematic approach to dispensing procedures
- * 2 ensure the legality and completeness of prescriptions presented at the pharmacy
- * 3 produce clear and complete labels for all dispensed medicines
- * 4 identify, utilise and communicate cautionary and advisory directions applying to dispensed medicines
- * 5 identify and apply storage conditions and container requirements for all dispensed medicines
- * 6 perform calculations required for dispensing medicines
- * 7 price accurately prescriptions using appropriate pricing schedules
- * 8 compound a range of prescribed liquid medicines, ointments and creams according to good dispensing practice
- * 9 develop and maintain a disciplined checking procedure in dispensing medicines
- * 10 maintain a system of recording all dispensed prescriptions
- * 11 dispense and maintain records of schedule 8 drug prescriptions
- * 12 maintain the confidentiality of patient services
- ** 13 decipher all prescriptions and accurately interpret or confirm the prescriber's intentions
- ** 14 identify potential interactions, overdoses, apparent errors, omissions or misuses in prescriptions and if necessary, verify with the prescriber
- *** 15 interpret the various Acts and Regulations governing the dispensing of prescriptions, including the National Health Act, the Veterans' Affairs Act, the Therapeutic Goods Act, and the poisons act
- *** 16 fulfil monthly "Doctor's Bag" requirements
- *** 17 respond appropriately to questions from patients on problems with medication

B The graduate trainee should be able to:

- ** 1 advise patients of part charge and full charge prescriptions and claims that may be made through private insurance agents
- ** 2 maintain a comprehensive patient medication record system
- *** 3 match from memory most brand names of medicines with generic equivalents

Figure 1 lists detailed competencies for the first major group, 'Dispensing'. Once professional competencies have been enumerated in this way, the next step is to develop procedures for assessing them. This strategy of identifying competencies and sub-competencies through a detailed analysis of workplace roles and tasks, and then attempting to make a direct assessment of each listed competency, is described by Ashenden as a 'revolution' in the assessment of occupational competence:

> If standards can be clearly stated, and if they can be closely related to occupations and the workplace,...a revolution in the assessment of individuals becomes possible... Clear and appropriate standards make possible the direct assessment of competencies, whether or not a course has been taken.
> (Ashenden, in *Employment and Skill Formation Council: The Recognition of Vocational Training and Learning*, 1990)

2.2 Competencies as Specific Skills

The desire to make occupational skills explicit and their assessment as objective as possible often leads to the development of detailed lists of areas, sub-areas, skills, and sub-skills in an occupation. These are then assembled into a checklist which becomes the basis for assessing competence. This is the basis of assessment systems such as the Western Australian New Apprenticeship Training and Assessment System (NATAS) which lists competencies and rules defining the minimum level of performance required for recognition as a tradesperson. Docking explains this approach:

> In many sectors of education and training--at secondary level, technical level (TAFE), in the trades, and in some professional areas, efforts are being made to express a syllabus in terms of specific competencies and to construct assessments to match these competencies.... The product of this process is a full listing of skills and a set of rules by which an apprentice's profile of achievement can be judged acceptable or unacceptable for certification.... Given a suitable listing of skills (and knowledge) and a set of rules by which to determine achievement, strategies for reliable and valid assessment can readily be determined. (Docking and Iredale, 1989)

As Docking indicates, once a 'full listing' of specific competencies has been developed, strategies for assessment are readily determined. Consider, for example, the following skills described by Thomson (1986, 1989):

PERFORMANCE OBJECTIVES	
Skill:	To measure the diameter of a wire.
Conditions:	Given a length of copper wire and a micrometer screw gauge.
Standard:	To an accuracy of + or - 0.005 mm.
Skill:	To recognise a fire extinguisher suitable for use on electrical fires.
Conditions:	From among a group of five class A, B, and C type extinguishers.
Standard:	With 100% accuracy.

These skills, expressed as 'performance objectives', suggest obvious methods of assessment, particularly if assessments are to be made at a single point in time. The precision with which the diameter of the wire must be measured and the success rate in recognising fire extinguishers are specified ahead of time, enabling a straightforward decision about whether or not these competencies have been demonstrated.

Skill checklists of this kind have been developed to specify and assess occupational performance objectives (and thus occupational standards) in the trades. Could similar skills checklists be developed as a basis for competency assessment in the professions?

A first difficulty with skills checklists as an approach to describing professional competence is that, in the attempt to be explicit and comprehensive, checklists rapidly become unwieldy and impractical. As Spencer (1983) notes:

> Job task analyses tend to be too detailed to be practical (e.g., lists of the 4,300 discrete behaviours required to drive a car or the 3,001 functions performed by a teacher).
>
> (Spencer, 1983, 10)

This problem might be managed if it were possible to identify and list only those behaviours that are central to a profession. But in a profession, the list of essential knowledge and skills is likely to be too extensive to be a practical basis for assessment.

A second difficulty with a skills checklist is that it may not provide a *valid* basis for describing and assessing professional competence. Attempts to implement 'full listings' of skills in professions such as Nursing, Law and Pharmacy in the US in the 1970s often 'atomised' the professional role, 'breaking it into highly

discrete tasks and behaviours' (Olesen, 1979). Pottinger (1979) argues that the preoccupation with discrete behavioural objectives often resulted in inappropriate approaches to defining and measuring professional competence:

> The job function analysis approach is often based primarily on motor skills analysis... Variations of this method exist, many of which fall under the rubric of the behavioural objectives approach. This approach, sometimes carried to extremes, results in taxonomies of hundreds, sometimes thousands, of skills connected with particular kinds of jobs... This preoccupation with specificity, clarity and precision of behavioural objectives has left many researchers with an operational paradigm for defining and measuring professional competencies which is intuitively and theoretically oversimplified and invalid. (Pottinger, 1979, 31-2)

Pottinger goes on to make the point that there are many personal qualities comprising professional competence that we would like to measure such as common sense, managerial skills, leadership abilities, interpersonal effectiveness, moral reasoning, empathy, initiative, and problem-solving ability. 'Unfortunately, those who award credentials and licenses have often settled for measuring small components of these qualities in terms of specific knowledge, skills and abilities that they hope are related to these more general qualities' (Pottinger, 1979, 39).

In developing recommendations for assessment methods in the professions, we have taken the position that competence in a profession involves much more than mastery of many discrete pieces of knowledge and skill. We believe that the attempt to atomise competence in this way runs the risk of focusing on only the more superficial elements of professional practice and of ignoring research evidence concerning the ways in which professionals actually operate on a day-to-day basis.

In many attempts to implement competency-based assessment in the professions we see a tension at work between two principal goals of the competency-based movement: the aim to be *explicit* about the 'competencies' that make up an occupation, and the aim to build an assessment system on an analysis of what it is that practitioners *actually do* in the workplace. The attempt to be explicit about competencies has led many competency-based assessment systems in the direction of long checklists of behavioural objectives of the kind described by Spencer. Studies of what professionals do in the workplace repeatedly emphasise the inappropriateness of characterising expertise as the possession of sets of unconnected facts and skills.

Kennedy (1987) argues that while a number of professions have been attracted to skills checklists as an approach to defining expertise, 'the attractive simplicity of the technical-skills view depends in part on its failure to consider the whole of professional practice', and those professions that have adopted this approach have eventually become disenchanted with it:

> The technical-skills definition of expertise has been most criticised for its assumptions about how technical skills contribute to professional practice. What the technical-skills orientation lacks is attention to the rest of professional practice: theory and principles, analytic capacity, and so forth. It overlooks the decisions that professionals make about whether and when to employ a particular skill. (Kennedy, 1987, 135-6)

A third difficulty with the development of skills checklists in the professions is that it is likely to be difficult to specify many professional skills in a precise and unambiguous way that makes them straightforward to assess. Consider, for example, the list of 'competencies' in Pharmacy shown in Figure 1. The last of the specific Dispensing Competencies is:

> To respond appropriately to questions from patients on problems with medication.

Superficially, this competency has the same form as the performance objective:

> To recognise a fire extinguisher suitable for use on electrical fires.

But the differences between these two superficially similar competencies are profound, particularly from the point of view of their assessment. Firstly, the ability to identify fire extinguishers suitable for use on electrical fires can be assessed efficiently and adequately in isolation from other, similar competencies. Responding appropriately to questions from patients, on the other hand, is likely to be best assessed in the context of realistic workplace problems involving pharmacist-patient interactions.

Secondly, the standard for satisfactory recognition of fire extinguishers can be easily described. The standard specified above is 'with 100% accuracy'. A pharmacist might be required to respond appropriately to patients' questions 100% of the time, but what constitutes an 'appropriate' response? Is it more difficult for pharmacists to respond appropriately to questions about some types of medication problems? If it is, must an 'appropriate' response be differently defined for different kinds of problems?

There is, as Kennedy says, an 'attractive simplicity' in skills checklists. They offer to simplify the task of assessing professional competence by enumerating isolated skills that, supposedly, can then be assessed one at a time in an obvious and objective fashion. Lists of competencies can certainly be useful, but we believe that detailed lists of isolated knowledge and skills are likely to be an inappropriate basis for assessing competence in the professions.

2.3 Higher-Order Skills?

One response to the observation that skills checklists are frequently dominated by low-level and psychomotor skills, has been to extend skills checklists to include 'higher-order' skills known to be important to an occupation. Professionals use a variety of higher-order skills beyond recalling and applying facts and skills. They must, in the course of their everyday work, evaluate evidence, create arguments and explanations from the available facts, formulate hypotheses about underlying causes and conditions, and so on. Perhaps the solution to past criticisms of attempts to use checklists as a basis for assessing professional competence is to ensure that these higher-order skills are also listed and assessed.

In medical practice, for example, it might be thought that doctors should be competent in applying the hypothetico-deductive method to the diagnosis of patient conditions. Certainly, many medical schools attempt to teach students to use systematic diagnostic procedures of this kind. Perhaps the assessment of medical competence should include a task to assess candidates' knowledge of, and ability to apply, the hypothetico-deductive method?

Similarly, there can be little doubt that the ability to 'think critically' is a key aspect of professional competence that is not adequately captured in lists of observable tasks and skills. Tests of critical thinking exist and might be used to assess this component of professional competence.

While such an approach to assessing professional competence recognises the existence of higher-order skills, it does not challenge the underlying premise of skills checklists that occupational competence can be captured in a list of observable behaviours. We believe that, because professional competence involves much more than the ability to carry out isolated tasks, tests of generic skills such as critical thinking and hypothetico-deductive reasoning are unlikely to provide *valid* assessments of competence in a profession.

We are led to this position in part by studies of how professionals operate in the workplace. These studies have raised doubts about the possibility of identifying general occupation-specific skills. What expert clinicians, for example, do in practice is surprisingly difficult to establish. The same individual often proceeds very differently with different clinical problems, some clinicians appear to use idiosyncratic strategies to arrive at diagnoses, and although medical students may be exhorted to adopt 'scientific' strategies of hypothesis formulation and testing, there is increasing doubt that experts make much use of these strategies in their everyday work:

> A consistent finding in the literature on measures of clinical problem-solving is that there are very low correlations across different problems... General skills such as data-gathering, problem-solving, or clinical

> judgement, if they exist, account for very little of the observed variation in performance on different patient management problems.
>
> (Norman, et al., 1985, 344-5)

From the point of view of assessment *validity*, we believe that assessment methods based on detailed checklists of isolated skills are unlikely to be as useful as methods which are more broadly based in complex, realistic workplace problems--even if checklists are extended to include 'higher-order' skills.

2.4 Knowledge?

Competency-based assessment is sometimes portrayed as an alternative to tests of knowledge which may be seen to assess primarily 'theoretical' or 'scholarly' learning. Under this view, competency-based assessment is seen as a direct assessment of performance in the workplace as opposed to an indirect assessment of procedural or factual knowledge in isolation from actual workplace tasks. Multiple-choice tests of knowledge are the subject of special criticism by some promoters of competency-based assessment because they test isolated facts and require recognition rather than generation of knowledge. Docking (1990), for example, describes multiple-choice tests as 'far removed from practical performance'.

As we have already noted, an emphasis on directly observable workplace skills has led many systems of competency-based assessment to emphasise observable, routinised task skills, often of a psychomotor kind. Kennedy (1987) refers to this as the 'technical-skills' approach to defining and assessing professional competence and criticizes this approach as paying insufficient attention to the role of knowledge of theory and principles in professional expertise.

Recent studies of experts in a wide range of fields have drawn attention to the crucial role that the professional's knowledge base plays in professional practice. There is increasing evidence that what distinguishes competent professionals from novices (e.g., students) is the access that competent professionals have to a rich and highly-organised knowledge base:

> Our research suggests that the knowledge of novices is organised around the literal objects explicitly given in a problem statement. Experts' knowledge, on the other hand, is organised around principles and abstractions that subsume these objects. These principles are not apparent in the problem statement but derive from knowledge of the subject matter... Our interpretation is that the problem-solving difficulty of novices can be attributed largely to the inadequacies of their knowledge bases... Current studies of high levels of competence support the recommendation that a significant focus for understanding expert

> thinking and problem solving and its development is investigation of the characteristics and influence of organised knowledge structures that are acquired over long periods of time.
>
> (Glaser, 1984, 98-99)

While tests of isolated factual knowledge alone are obviously inadequate as a basis for assessing professional competence, we believe it would be a mistake to introduce a system of competency-based assessment that overemphasized observable technical skills and failed to recognise the crucial role that a rich base of factual and procedural knowledge plays in professional competence. The challenge, as we see it, is to find the most appropriate ways of assessing a candidate's ability to draw on their knowledge base to solve practical workplace problems.

2.5 Defining Areas of Competence

In Section 2.2 we noted that some previous attempts to implement competency-based assessments have taken what might be described as a *task-based* approach to assessment. Under this approach, lists of 'competencies' in the form of tasks (often psychomotor tasks) are developed. The method of assessment is to administer the task described by the competency. This approach either assumes that the ability to complete a task is indicative of competence or describes the nature of the required performance on the task in such general terms ('adequately', 'effectively', 'appropriately') that it cannot easily be interpreted in practice. While there are obviously technical skills that a professional must be able to perform competently, we believe that professional competence cannot be adequately conceptualised and assessed in terms of lists of precisely-defined skills.

In Section 2.3 we considered the possibility of what might be referred to as a *cognitive skills* approach to describing professional competence. Under this approach, a range of higher-order skills such as critical thinking and heuristic problem-solving might be seen to underlie competent professional practice. These would be listed and form the basis of assessment methods. We noted the research evidence suggesting that candidates' abilities to apply generic skills in isolation are often poor predictors of their ability to solve practical professional problems in the workplace. We believe that professional competence will not be adequately conceptualised and assessed in terms of general higher-order thinking skills and strategies.

In Section 2.4 we considered a *knowledge-based* approach to conceptualising professional competence. We noted the research evidence pointing to the crucial role of the expert's knowledge base in professional practice. But we concluded that professional competence is not adequately conceptualised and assessed in terms of knowledge alone, particularly through tests of decontextualised knowledge. Factual and procedural knowledge must be

assessed, but in the context of the candidate's ability to draw on that knowledge to solve realistic problems.

This is not to say that we believe there is no value in attempting to identify and list the kinds of skills and knowledge that are important in a profession. But we believe that checklists of specific skills and knowledge do not in general provide an adequate basis for conceptualising professional competence, setting minimum performance standards, or assessing candidates against those standards.

In consultation with the authors of the companion paper, we believe that the conceptualisation of professional competence requires a more holistic approach in which competence is conceptualised as the ability to draw on and to integrate a variety of knowledge and skills to address realistic workplace problems. The question then becomes: what are the broad areas of professional practice in which a candidate must demonstrate at least minimal competence? We see the conceptualisation and assessment of professional competence as a multi-step process. The steps in this process are:

- *Step 1*. An analysis of the roles and tasks that professionals undertake in the course of their everyday work.

- *Step 2*. An analysis of the kinds of knowledge and skills required by practising professionals. In general, skills will be those involved in a range of professional tasks, and knowledge will be that required for a number of areas of practice.

- *Step 3*. A decision about the areas of professional practice in which candidates will be required to demonstrate at least minimum competence. Candidates will be assessed in each of these areas.

- *Step 4*. A description of the minimum required level of competence in each of these identified areas. This description is the 'standard' for that area. It should describe criteria to be used in judging a candidate's performance.

- *Step 5*. The development of appropriate methods of assessment for each area of practice identified in Step 3. The purpose of assessment is to infer from a candidate's performance their underlying level of competence in that area.

- *Step 6*. The comparison of a candidate's performance with the standard set in Step 4 and a judgement as to whether or not the standard has been satisfied.

Steps 1 and 2 in this process involve a review of professional practice and are addressed in detail in the companion paper where a variety of techniques for analysing professional tasks/roles and attributes are described. Important questions in this process are:

- What are the major aspects or divisions of the profession?
- What are the roles that members of this profession play?
- What are important tasks in the day-to-day activities of a practising member of this profession?
- What areas or kinds of knowledge does the competent professional need?
- What kinds of skills and abilities does the competent professional need?
- What are the affective and inter-personal qualities desirable in the professional?

Out of this professional analysis we envisage the identification of key areas of competence. These will be aspects of the profession for which it is decided that candidates will be required to demonstrate at least a minimum level of competence. The number of such areas and the precision with which individual competencies are specified will be a matter for the profession to decide.

We believe that in identifying areas of competence for which assessments are to be conducted, professions should be looking to identify key knowledge and skills in the context of realistic professional tasks. This requires that knowledge, skills and professional tasks be brought together in some way.

There are a number of examples of attempts to bring together knowledge, skills and key tasks undertaken in a profession. One example is shown in Figure 2. The matrix in Figure 2 was developed by Burg, Lloyd and Templeton (1982) as a framework for conceptualising clinical competence in medicine. Their framework is adapted from a model developed by the National Board of Medical Examiners in the United States as a basis for its Comprehensive Qualifying Evaluation Program at the end of medical school.

Figure 2 identifies five broad areas of knowledge and skill across the page. Down the page are eight areas of professional activity in which these skills and knowledge can be applied. A third dimension to this matrix (not shown here) consists of different areas of medical practice. Burg, Lloyd and Templeton suggest that these areas of medical practice can be categorised as involving well patients and ill patients and within each of these categories, different kinds of medical cases could be identified.

The conceptual framework in Figure 2 might be used to guide the assessment of candidates in clinical medicine. We see this framework being used as a guide to aspects of a candidate's performance that might be taken into consideration in the assessment process. A decision might be made, for example, that candidates must demonstrate at least minimum competence in diagnosing and managing a particular class of medical cases. In assessing a candidate's performance in this area of medical practice, the assessor would pay attention to the aspects of performance listed in Figure 2.

FIGURE 2: CONCEPTUALISING COMPETENCE IN CLINICAL MEDICINE

Source: Burg, Lloyd and Templeton (1982)

	AREAS OF KNOWLEDGE / SKILL				
	1 KNOWLEDGE, UNDER-STANDING	2 PROBLEM SOLVING, CLINICAL JUDGE-MENT	3 ATTITUDES, WORK HABITS.	4 INTERPER-SONAL SKILLS	5 TECHNICAL SKILLS.
PROFESSIONAL TASKS					
HISTORY TAKING					
PHYSICAL EXAM.					
LABORATORY TESTS					
DEFINING PROBLEM					
MANAGEMENT					
RECORD KEEPING					
SPECIAL SOURCES					
MONITORING HEALTH					

With Figure 2 as an assessment framework, the next issue is to decide on the minimum acceptable level of candidate performance (i.e., standard). In developing a description of what it means to be minimally competent in medical diagnosis, we imagine that the profession would be addressing such questions as: What sorts of conditions should a minimally competent practitioner be able to identify? What kinds of decisions should a minimally competent practitioner be able to make in respect of cases of this kind? What should a minimally competent practitioner *not* do in managing this class of medical cases? In developing a general description of what it means to be minimally competent in the diagnosis of medical problems (or of a class of medical problems), reference might be made to the various professional tasks, knowledge and skill listed in Figure 2.

Step 5 requires the identification and development of *methods of assessment* appropriate to the key areas of professional competence identified in Step 3. There are many considerations in the choice of appropriate assessment methods, including the following:

- What assessment tasks are most appropriate to the area of professional practice being assessed?
- Which methods of assessment is it feasible to implement?
- Are some tasks likely to be better than others for judging competence against the defined standard?
- How can the standard established for an area of professional practice be interpreted and applied to performances on the particular assessment tasks used?

To assess candidates' levels of competence in medical diagnosis and patient management, assessments might take the form of simulated patient management problems. In assessing a candidate's performance on each case, a record might be kept of the decisions made at each point in the management of the 'patient', and appropriate decisions and actions noted, together with omissions, errors, and any unnecessary action. There is already a great deal of experience available in the implementation and interpretation of simulated patient management problems. Typically, candidates are required to take several problems of this kind, perhaps from pre-determined classes of medical cases.

In the development of assessment procedures for pharmacy (see Figure 1), we would recommend the same general approach: identify broad areas of professional practice in which a candidate must demonstrate at least minimum competence, define standards of minimum competence for each of these areas, and use realistic workplace tasks to compare candidates' performances with pre-defined standards. In the area of Primary Health Care, for example, we believe that a candidate's level of competence will be most validly assessed by presenting him or her with a number of realistic scenarios or tasks. These scenarios would be as similar as possible to the dynamic pharmacist-customer interactions that take place in community practice. Several scenarios might be

used to provide opportunities to explore the candidate's knowledge and skills in a variety of aspects of professional practice. The list of 'competencies' in Figure 1 would guide the construction of assessment scenarios.

In Step 6, a candidate's performances on set assessment tasks are compared with pre-defined standards for each of the areas being assessed. In the medical diagnosis example, a candidate's overall performance on a case (or set of cases) would be compared with the standard developed for competence in that area of medical practice, and a judgement made about whether the candidate displayed the required level of competence. This process inevitably involves professional judgement and, in reaching a judgement, account needs to be taken of many different aspects of a candidate's performance. Lists of detailed competencies might be used as the basis for formulating criteria to be considered in making a judgement and for directing assessors to critical aspects of a performance.

2.6 Clarifying Terminology

Before leaving this section, it is useful to review and clarify a number of key terms that we are using.

Competence
It is common to describe a person as 'competent' in an area of practice if they have the knowledge, skills and attitudes to be able to function at some minimum acceptable level. Somebody who is unable to function at this level is commonly described as 'incompetent'. In other words, competence and incompetence are thought of as two alternative and complimentary states.

In this paper we use the word competence in a slightly different way. We describe aspects of professional practice as 'areas of competence' and we think of candidates as having varying degrees or 'levels of competence' within each of these areas. The question to be asked of each candidate is whether their level of competence meets the minimum acceptable level (i.e., standard) for that area of professional practice.

Areas of Competence ('Competencies')
In this paper we assume that, within a profession, it will be desirable to identify a number of areas or aspects of professional practice in which candidates will be assessed and for which minimum acceptable levels of competence will be established. We refer to these aspects of professional practice as 'Areas of Competence' or 'Competencies'.

Performance
To assess a candidate's level of competence in an area of professional practice it is necessary to collect observations of *performance*--usually on specially-designed

assessment tasks. In this paper we assume that, within an area of professional practice, candidates will differ in their underlying levels of competence. These levels cannot be observed directly but must be inferred from candidates' performances on relevant workplace tasks.

Standard

A standard is a minimum acceptable level of performance in an area of professional competence. We assume that the minimum acceptable level of performance in an area will be different for different purposes (e.g., for different occupational levels).

It is important that a distinction be maintained between

- the various areas of professional practice in which a candidate is to be assessed and, within each of these areas,
- the minimum acceptable level of competence (standard) against which candidates are to be judged.

We believe that this important distinction is sometimes blurred in attempts to develop competency-based standards and assessments. Frequently, competencies themselves are being referred to as 'standards'. Figure 3, for example, is a list of areas in which an occupational therapist is expected to be able to function with at least a minimum level of competence. This list of competencies is referred to as a set of 'standards' of practice. We believe that these do not qualify as 'standards' because they do not describe minimum levels of required competence in the aspects of professional practice listed. We understand that standards are now being developed for this list of competencies in occupational therapy.

Similarly, we would not consider the list of competencies adopted by the Dietetics Association of Australia (Figure 4) to be a description of 'minimum standards'. Figure 4 shows five Competency Areas identified in the statement and lists specific skills for one of the five Areas. We believe that statements like:

> Demonstrates basic skills in research method.

are better described as professional competencies. A 'standard' would be a description of the minimum level of basic skill in research method acceptable for practice as a dietitian.

FIGURE 3: STANDARDS OF PRACTICE

Source: *Western Australian Association of Occupational Therapists*

These Standards will assist registered and practising Occupational Therapists in evaluating their efficiency and effectiveness in the delivery of Occupational Therapy services.
The Standards apply to institutional and community-based services.
They serve as a minimum standard of Occupational Therapy practice, as expected of a base grade therapist.
They are not intended to restrict development of higher departmental or individual competencies.

Standard 1: Screening

The Occupational Therapist shall :-

1. Independently or as a team member, identify clients who present with problems in occupational performance.

2. Select a minimum of one screening method from standardised or non-standardised formats available that is appropriate to the client's age, sex, education, cultural background, medical status and functional ability.

3. Communicate the results of screening with recommendations, to all appropriate team members and to the client(s).

Standard II: Referral

The Occupational Therapist shall :-

1. Accept and document the date of receipt of referral to occupational therapy for rehabilitation, maintenance or prevention, when the client has, or appears to have, a dysfunction or potential for dysfunction in occupational performance or performance components.

2. Respond to a request for service and enter a case at their own professional discretion and on their own cognizance, and then assume full responsibility for the determination of appropriate type, nature and mode of occupational therapy service.

Standard III: Assessment

Standard IV: Individual Programme Planning

Standard V: Individual Programme Implementation

Standard VI: Discontinuation of Services

Standard VII: Quality Assurance

Standard VIII: Indirect Services

Standard IX: Legal/Ethical Components

FIGURE 4: MINIMUM STANDARDS FOR THE PROFESSIONAL TRAINING OF DIETITIANS

Source: Dietitians' Association of Australia

Areas of Competence

Organisation and Management

Assessment and Planning

Implementation

Evaluation

Professional Practice and Personal Development

A list of statements is offered under each heading. For instance, the Assessment and Planning section is as follows:

Assessment and Planning

Demonstrates basic skills in research method.

Demonstrates skills in the collection and assessment of data related to the health and nutritional status of individuals and groups.

Demonstrates skills in evaluating nutrition and health related data/literature/policies.

Applies knowledge of food and nutrition to the planning of nutritional care of an individual or population.

Applies knowledge of biochemistry and physiology to an understanding of nutrition related diseases.

Develops plans for optimising the nutritional health of individuals.

Develops plans for optimising the nutritional health of populations.

Plans a review of a simple food service system.

PART III. SETTING STANDARDS: IMPLICATIONS FOR ASSESSMENT

3.1 What is a Standard?

> A standard is an answer to the question, 'How good is good enough?' and this question can be answered only by someone's judgement. (Living ston and Zieky, 1982, 12)

In Part II we saw that decisions about how professional competence is conceptualised have far-reaching implications for the choice of assessment methods. In this section we show how the approach taken to setting performance 'standards' also profoundly influences how candidates are to be assessed.

We expect that standard setting will be carried out after the identification of areas of professional practice in which candidates will be required to demonstrate at least minimum competence. Through the standard setting process, professions will spell out what it means to be at least minimally competent in each of the areas they have identified. The verbal descriptions of these minimum performance levels we refer to as 'standards'. In this section we consider what a performance standard might look like in an area of professional practice and consider some issues in developing standards for the professions.

3.2 Some Types of 'Standards'

In work currently underway to develop competency-based training and assessment in trades and in some professions it is possible to see several different ways of thinking about a standard. Three broad approaches can be discerned:

Precise Standards
In the examples taken from trade training in the previous section we saw several examples of what might be described as 'precise standards'. The standard set for measuring the thickness of a piece of wire with a micrometer screw gauge, for example, was 'to an accuracy of + or - .005mm'. The standard set for recognising fire extinguishers suitable for use on electrical fires was 'with 100% accuracy'.

These are precise and unambiguous performance standards. They are tightly linked to particular assessment tasks. In general, there is no role for professional judgement in decisions about whether or not a standard has been met. Provided the correct answers (e.g., the true thickness of the piece of wire) are known, the comparison of a candidate's answer with the correct answer

and the decision about whether the standard has been met are clerical tasks that might even be carried out by computer.

Task Statements
As we saw in Part II, some of the 'standards' now being developed for particular occupations take the form of lists of specific tasks that members of an occupation should be able to perform. In some ways, these statements resemble the competency statements described by Thomson (e.g., 'recognises a fire extinguisher suitable for use on electrical fires'). However, they are usually not accompanied by separate statements of performance standards (e.g., 'with 100% accuracy'). Task statements being developed for professions often attempt to describe simultaneously both an area of competence and a performance standard. These standards are either implied (with 100% accuracy all the time) or are couched in vague terms such as 'adequately', 'effectively', and 'appropriately'.

The 'minimum standards' developed by the Dietitians Association of Australia, for example, include:

- works effectively within an organisation.
- demonstrates basic skills in research method.
- applies knowledge of food and nutrition to the planning of nutritional care of an individual or population.

As task statements, these are useful. As descriptions of required *standards* of performance, they are too vague to be useful. What does it mean to work 'effectively'? What sorts of basic research skills should a minimally competent dietitian be able to demonstrate? Performance *standards* for these three aspects of professional practice would assist in identifying candidates who do not satisfy minimum required levels of performance in each.

Standards as Described Levels of Performance
A third type of standard is a verbal (i.e., written) description of a level of performance in an area of competence. This is perhaps best explained with an example.

The Australian Medical Council (AMC) requires candidates to satisfy a minimum standard of competence in English. Candidates are assessed in four different *areas of competence*: Reading, Writing, Speaking, and Listening. For each of these areas, the minimum required level of competence (i.e., *standard*) is defined as Level 3 of the Australian Second Language Proficiency Ratings (ASLPR). The ASLPR describes a number of levels of competence in each of these four areas, beginning at Level 0 and working up to Level 5. The

minimum level presently accepted by the AMC is Level 3, but there is some discussion about whether the standard should be Level 4.

Figure 5 shows Levels 2, 3 and 4 of the ASLPR for Speaking. In addition to the general description of these three performance levels, examples are provided of the kinds of conversations in which a person functioning at each of these levels should be able to engage. In the assessment process, candidates engage in a conversation with an expert assessor who judges their levels of speaking competence in terms of the framework provided by the ASLPR levels. The question of interest currently is whether the candidate is performing at the standard (i.e., ASLPR Level 3). To make this judgement, the expert assessor must compare the candidate's performance with the general descriptions of these three levels and interpret these in the context of the conversation with the candidate. According to the developers of the ASLPR:

> the defined points [i.e., levels on the scale] are neither absolute nor discrete. Rather, each definition exists in relation to the whole scale and in relation to other definitions. Thus, to show gradations of development, some descriptions are unavoidably comparative in nature... It must be stressed that it is the observer's assessment that is important and the definitions provided are not to be regarded as checklists.
>
> (Ingram and Wylie, 1984)

3.3 Implications for Assessment

The different approaches to setting standards outlined in Section 3.2 have different implications for the choice of suitable assessment methods:

Precise Standards

If precise standards are to be defined for an occupation, then separate assessment tasks are required for each listed competency. The purpose of assessment is to decide whether a candidate can demonstrate some pre-determined minimum standard of performance on each task. In general, many distinct assessment tasks will be required, each linked to a particular performance objective. Standards will be specified precisely, enabling objective decisions to be made about whether each competency has been mastered. There will in general be little need for professional judgement in the assessment process.

FIGURE 5: LEVELS 2, 3, 4 OF ASLPR IN SPEAKING

GENERAL DESCRIPTION
S:4 Vocational Proficiency Able to use the language fluently and accurately on all levels normally pertinent to personal, social, academic or vocational needs. Can participate in any conversation within the range of own experience with a high degree of fluency and precision of vocabulary; while the learner has mastered commonly occurring colloquial and idiomatic forms, some misuse of other items may occur; would rarely be taken for a native speaker, but can respond appropriately even in unfamiliar situations; while a 'foreign accent' may continue (especially in intonation and stress patterns), pronunciation does not impede comprehension by a native speaker; errors of grammar are quite rare and unsystematic and can usually be corrected in retrospect; always easily understood by a native speaker. Has considerable sensitivity to register requirements and readily modifies the language appropriately.
S:3 Minimum vocational proficiency Able to speak the language with sufficient structural accuracy and vocabulary to participate effectively in most formal and informal conversations or practical, social and vocational topics. Can discuss own particular interests and special fields of competence with reasonable ease though some circumlocutions; vocabulary is broad enough that the learner rarely has to grope for a word and can readily overcome gaps with circumlocutions; accent may be obviously foreign; control of grammar good; able to convey meaning precisely in reasonably complex sentences or by using, with reasonable accuracy, a wide range of modification devices; fluency is rarely disrupted by hesitations; errors rarely interfere with understanding or disturb the native speaker; able to modify language to meet the differing register requirements of situations which are familiar in the learner's personal and vocational life but can make secure use of only high frequency colloquialisms.
S:2 Minimum social proficiency Able to satisfy routine social demands and limited work requirements. Can handle with confidence but not facility most social situations including social introductions and casual conversations about current events, as well as work, family and autobiographical information. Has restricted register flexibility though, where a specialist register has been experience, will have acquired some features of it. Has limited ability to vary the 'tone' of utterances. Can handle limited work requirements but will need help in handling any complications or difficulties. Hesitations are still frequent as the learner searches for vocabulary or grammar, but has a speaking vocabulary sufficient to express himself simply with circumlocutions on most topics pertinent to his everyday life; can usually handle elementary constructions quite accurately but does not have thorough or confident control of the grammar especially in longer constructions. Accent, though often quite faulty, is intelligible; undue exertion on the part of a native-speaking listener is not often necessary though some repetition in order to be understood may occur. Overall rate of utterance remains less than the native speaker's as a result of hesitations. Cohesion and discourse in short utterances or tests are secure but inconsistencies occur in longer ones.

EXAMPLES & COMMENTS
Example Can convey exact meaning in social and vocational discussions unrestricted by lexical or grammatical deficiencies; can modify speech deliberately according to the situation and its register requirements; can handle informal interpreting from first language. **Comment** Cultural understanding now plays a significant part in promoting language use. Grammatical development is now more or less complete though 'slips' or errors of performance may still occur. The learner can, however, usually correct such errors if he or she becomes conscious of them.
Example Can handle with confidence most social situations and those work situations relevant to own needs and experience. Can enter, exit from and participate in conversation with or between native speakers; can speak to educated native speakers or to those at own socioeconomic level on general or relevant vocational topics without unintentionally amusing or irritating them; can present and debate own or others' ideas and attitudes about familiar topics or topics which are relevant to own or target culture; can cope with everyday difficult linguistic situations, such as broken plumbing, a personal misunderstanding, undeserved traffic ticket, etc. **Comment** The key factor now emerging is register flexibility (as well as continued development in fluency and accuracy). Fluency refers to the ability to mobilise language components in connected expression.
Example Can give detailed information about own family, living conditions, educational background; can describe and converse on everyday things in his environment (e.g., his suburb, the weather); can describe present or most recent job or activity; can communicate on the spot with fellow workers or immediate superior (e.g., ask questions about job, make complaints about work conditions, time off, etc.); can give simple messages over the telephone; can give directions and instructions for simple tasks in his everyday life (e.g., to tradesmen). Has tentative use of polite request forms, e.g., involving could, would. May sometimes offend by unintended blandness or aggressiveness, or irritate by over-deference where native speakers expect informality. **Comment** At this level, the learner's ability is sufficient to enable him to establish normal social relationships with native speakers.

Task Statements
Task statements may resemble statements of precise competencies. But they are usually not as tightly linked to specific workplace tasks and they do not define standards of performance with the same degree of precision. Typically, they describe required levels of performance using qualifiers such as 'effectively', 'appropriately' and 'adequately' which must then be interpreted by assessors.

Consider, for example, the statements:

> Works effectively in an organisation;
> Applies knowledge of biochemistry and physiology to an understanding of nutrition-related diseases.

taken from a list of 'minimum standards' developed for one profession. The assessment of competencies of this kind requires multiple observations over a period of time. Such assessments might be made by a supervisor reflecting on a candidate's performance during placement in a workplace, for example, and might form part of a checklist that the supervisor completes. In completing such a checklist, the assessor must provide his or her own interpretation of what it means to work 'effectively' in an organisation and of the minimum level of required competence in applying biochemistry and physiology knowledge to nutrition-related diseases.

Described Levels of Performance
The third approach to setting standards shares elements of the first two approaches as well as being importantly different from both. Like the first approach, it attempts to describe the required standard in some detail. But it does not provide precise, objective standards (e.g., 'to the nearest .005mm'; 'with 100% accuracy'). Like the second approach, it requires professional interpretation. But it does not rely on vague qualifiers (e.g., 'effectively', 'adequately'). Instead, this approach describes the kinds of knowledge, understanding and skill typical of candidates performing at various levels of competence within relatively broadly-defined areas of professional practice.

This approach to defining standards has important implications for the choice of suitable assessment methods. It does not require large numbers of assessment tasks to assess individual competencies on a checklist. Nor does it depend on supervisors' global judgements of 'adequacy' in various areas of professional practice. The key features of this approach are:

- the underlying notion that candidates have different levels of competence that can be described for broadly-defined areas of professional practice;

- the development of general verbal descriptions of these levels of competence -- made as explicit as possible and accompanied by examples to illustrate each level;

- the specification of a 'standard': the level of competence that represents the minimum acceptable level for a particular purpose;

- a recognition that professional judgement will be required to decide whether a candidate is performing at the level of the standard. To make this judgement, candidates will be required to undertake one or more assessment tasks, and assessors will be required to interpret general descriptions of standards as they apply in these tasks.

3.4 Some Considerations in Standard Setting

Once a decision has been made about what form a standard is going to take (precise / task statement / level description), and how it is to be implemented in practice, there is the question of how the standard itself will be decided.

- Why to the nearest .005mm? Why is measuring to the nearest .01mm not good enough?

- Why with 100% accuracy? Would 95% accuracy be sufficient?

- Why ASLPR Level 3? Why not Level 4?

A standard is an answer to the question, 'How good is good enough?', and this question can be answered only by professional judgement. In setting a standard for an area of occupational competence, an attempt is made to avoid two kinds of wrong decisions:

- a decision to register for practice somebody who is not competent to practice;
- a decision to bar from practice somebody who is competent.

These two possibilities must be kept in mind when setting standards. Every time an assessment is made and a candidate's performance is compared with a minimum acceptable result, there is the possibility of one of these two wrong decisions. Because all educational measures have associated errors of measurement, there is always a chance of a wrong decision being made. A candidate's factual knowledge may be judged adequate as a result of a few lucky guesses on a multiple-choice examination; another candidate's performance on a practical test may be judged inadequate because they were unlucky enough to be assigned a sample of tasks that did not reflect their true level of skill.

Setting a high standard minimises the chances of allowing incompetent persons to practice. But this is at the expense of errors of the other kind: rejecting competent candidates. Setting a low standard minimises the chances of rejecting competent candidates but increases errors in admitting incompetent persons.

In setting a standard, a decision must be made about the cost of making wrong decisions. In a staged recognition process, the costs are likely to be different at different points in the decision process. A multiple-choice examination might provide a convenient screening test as a first stage in the selection process. It is also a fairly indirect measure of professional competence and so may not be as valid as more direct measures of performance on realistic professional tasks. In this first stage of the decision process it might be decided that there are low costs associated with errors in allowing incompetent persons to proceed to a subsequent stage in the process. In this case, a relatively lenient standard might be set. On the other hand, a more stringent standard might be considered desirable later in the decision process.

There are several general approaches to setting a minimum required standard:

Norm-Referenced Standards

Under a normative approach, the passing standard is set in relation to the group of candidates. In some states, for example, a decision has been made that 80 percent of candidates sitting each Year 12 examination will pass, and 20 percent will fail. In this way, the pass mark is defined as the mark above which 80 percent of candidates perform in any particular year. The passing standard is said to be defined 'normatively'. When standards are set in this way, the levels of knowledge, understanding and skill required to 'pass' a subject can vary from year to year.

Task-Referenced Standards

A second general approach to setting standards is to begin with a list of precisely-defined skills or behaviours. Narrowly-defined competencies of this kind are referred to in the educational literature as 'objectives'. According to Bloom *et al.* (1971, p28), objectives should be stated as *directly observable* student behaviours which can be reliably recorded as either present or absent. They should be 'stated in terms which are operational, involving reliable observation and allowing no leeway in interpretation'. To achieve this degree of reliability, assessors are encouraged to state objectives as observable *tasks* such as 'calculating', 'matching', 'recognizing', 'selecting', 'naming', 'listing', and 'stating'.

If the objective is to measure the thickness of a piece of wire, for example, then the standard can be defined in precise terms for that particular task. Task-referenced standards can also be expressed as required success rates. In

educational assessment it is common to consider an objective to have been 'mastered' if a candidate is successful on 80 percent of tasks developed for that objective (a child might be considered to have 'mastered' 2-digit addition, for example, if he or she is able to answer correctly 80 percent of 2-digit addition tasks).

Criterion-Referenced Standards

The concept of a 'criterion-referenced' standard was introduced by Robert Glaser in 1963. In criterion-referencing, performances are compared with stages on a scale of increasing competence:

> Underlying the concept of achievement measurement is the notion of a continuum of knowledge acquisition ranging from no proficiency at all to perfect performance. An individual's achievement level falls at some point on this continuum as indicated by the behaviors he displays during testing... The standard against which a student's performance is compared when measured in a criterion-referenced way is the behavior which defines each point on the achievement continuum.
> (Glaser, 1963, 519-20)

As Cole (1990) points out, in the years since 1963, criterion-referencing has often been confused with lists of behavioural objectives, each linked to an observable task:

> Although the name *criterion-referenced* became popular after Glaser and Nitko (1971) used the term, there is little relation between the popularized version and the Glaser-Nitko approach. The popular application has involved a largely unconnected pool or list of objectives (each linked to test items) whereas the Glaser-Nitko proposal was for tests linked to a scale of increasing competence or achievement corresponding to an instructional path building toward increasingly advanced forms of learning. (Cole, 1990, 6)

Criterion-referencing recognises that candidates have varying degrees of competence within an area of professional activity and sets out to construct and make explicit a 'scale of increasing competence' in terms of which candidates can be assessed and minimum required standards can be specified. The ASLPR scale is an example of a criterion-referenced scale that permits the setting of criterion-referenced standards. Sadler (1987) refers to this method as 'standards-referenced' assessment.

3.5 Standard Setting in the Professions

We believe that a competency-based assessment system for the professions should be based on the following principles:

- Within each area of competence, the minimum satisfactory level of competence should be described as definitely and explicitly as possible.

- In setting standards, account must be taken of the levels of competence typically found among Australian graduates and practitioners in a profession.

- For many areas of professional practice, the most appropriate approach to defining standards will be to identify a minimum acceptable level on a scale of generally-described levels of competence (cf. ASLPR).

- Decisions about whether a minimum level of competence has been achieved must be based on a person's performances on some relevant tasks.

- Decisions about what constitutes a competent performance on a set of assessment tasks will in general require assessors to interpret standards as they apply to particular tasks.

These principles can be illustrated for the area of 'patient management' mentioned earlier. An attempt might be made to spell out what it means to be minimally competent in patient management. This would be a description of some absolute standard of competence in patient management (or in the management of particular kinds of medical cases) that every general practitioner would have to achieve. This standard might become part of a system of national occupational skill standards for doctors.

We believe that it is desirable to work towards generally-described skill standards of this kind. But it will never be possible to define a standard for such an important area of professional practice in a very precise and unambiguous way.

An attempt could be made to develop a list of activities that a candidate would have to be able to perform competently. This might include 'taking a patient history', 'conducting a physical examination', 'ordering laboratory tests', 'admitting to hospital', 'prescribing medication', 'ordering an X-ray', and 'moving out of intensive care'. Conceivably, a comprehensive list of activities associated with patient management could be constructed. But even if it were possible to define what it means to be competent in an activity like 'prescribing medication', we believe it would be inappropriate to define competence in patient management on the basis of the ability to perform isolated tasks of this kind. Patient management, by definition, is a complex and dynamic process of formulating hypotheses about underlying conditions, making decisions about appropriate treatments and interventions, and responding to changes in a patient's condition as they occur. A judgement about competence in patient

management must be based on much more than a checklist of actions that a doctor must be able to perform competently.

For these reasons, we recommend a more global description of what it means to be minimally competent in patient management. An important part of this 'standard' would be illustrations: descriptions of what a minimally competent practitioner should be able to do when confronted with particular kinds of medical cases. Such a description could never fully capture what it means to be competent in such a complex area of activity and would not allow precise, unambiguous decisions about whether or not the standard had been met. Nevertheless, we believe that standards of this kind would be important and valuable elements of a competency statement for a profession.

In the assessment process, performances would be evaluated against the minimum required level of competence. Because medical cases differ in their complexity, a minimally competent practitioner could be expected to experience differing degrees of success with different kinds of cases. A decision about whether a person showed evidence of minimal competence in patient management would require professional judgement in the light of the generally-described standard and on the basis of that person's management of one or more specific cases. In other words, assessors would be required to *interpret* the standards for particular tasks.

A number of methods that can be used by a profession to set and apply standards are discussed in the educational measurement literature. These methods tend to have been developed for traditional tests and examinations, but the principles can often be generalised to other assessment methods. We believe these methods, or adaptations of them, may be of value in setting *a priori* standards for areas of professional competence and for interpreting or applying those standards. Brief descriptions of several methods follow.

The Nedelsky Method

The Nedelsky method is used most commonly to set minimally acceptable performance levels on multiple-choice examinations. The method requires a panel of experts (judges) to meet and study the questions on an examination. These judges must be in a position to decide what level of knowledge or skill is essential for competent practice in an area of a profession. Livingston and Zieky (1982) report using this method with as few as five judges, but recommend panels of more than five.

The method first asks judges to imagine a 'borderline' (i.e., barely competent) candidate in the area being assessed. What sorts of knowledge and skill would this barely-competent person have? Members of the panel are encouraged to discuss their concept of border-line competence in this area, perhaps illustrating it by describing the performances of specific people they have

worked with. In this way, some group consensus is reached about the notion of a minimally-acceptable level of competence in this area.

Once a general concept of a minimally-acceptable level of competence has been developed and documented, each panel member is asked to look at the alternatives to a particular multiple-choice question and to identify those that a minimally-competent person should be able to identify as wrong. If a judge believes that a minimally-competent person should be able to eliminate three of five alternatives, then it is assumed that a minimally-competent candidate will have a probability of .5 of guessing correctly. This becomes the candidate's expected score on that question. This process is repeated for all questions and expected scores are summed to obtain that judge's expected test score for a minimally-competent person.

The spread of judges' expected examination scores defines a region of minimum competence on the examination score scale. Judges' scores can be averaged to define a precise cut-score if that is desired. But it has to be remembered that 50 percent of candidates identified by these judges as 'minimally-competent' can be expected to score above this cut-score, and 50 percent should score below.

The Angoff Method

This method is very similar to the Nedelsky method but can be used with examinations that are not multiple-choice. Each judge considers each question as a whole and makes a judgement of the probability (between 0.00 and 1.00) of a minimally-competent candidate answering that question correctly. This is repeated for all questions and the probabilities are summed over questions to obtain that judge's expected examination score for a minimally-competent candidate. The spread of judge's expected scores again defines a region of minimum competence on the examination score scale.

The Angoff Method can be generalised to examination questions that are worth more than one mark by asking each judge to estimate the score that a minimally-competent candidate would make on each question and then summing these scores over questions.

The Borderline Group Method

This method depends on the availability of evidence other than the assessment instrument or procedure of interest. To decide on a minimum standard, judges are asked to draw on other knowledge they have of the candidates. This method might be applied, for example, by asking people who had supervised candidates in a workplace setting to judge whether or not a candidate had a minimally acceptable level of knowledge or skill in an area assessed by an examination.

The Borderline Group method would ask supervisors to identify those candidates who they considered borderline in the area of interest. The examination scores of this subgroup of 'borderline' candidates would then be examined. These scores might be used to define a region of minimum competence that could be applied in future uses of the same examination (or in future uses of other examinations linked to this one through shared questions). The median score of this borderline group might be interpreted as a cut-off score if that was required.

The Contrasting Groups Method
This method works in the same way as the Borderline Group Method except that supervisors would be asked to make a judgement about every candidate they saw as being either competent or incompetent in the area being assessed. Various procedures have been suggested for constructing a cut-score from judgements made in this way. One approach is to plot the percentage of candidates judged competent by their supervisor against examination score, smooth the obtained curve, and set the cut-score at the level where 50 percent of candidates are being judged competent.

The Reference Group Method
This method depends on the availability of another group of candidates and sets the standard in relation to the performances of this reference group. In the context of overseas skills recognition, an obvious reference group would be graduates of Australian professional courses or persons already practising in the profession in Australia. Before deciding on a standard it would seem important to know how practising professionals in this country perform on the same task. A decision might be made to set the standard in such a way that it would not fail more than a fixed percentage of the reference group.

A number of writers (e.g., Jaeger) have argued that, even in applying procedures like the Nedelsky and Angoff Methods, there is a need to inform judges about how candidates have actually performed on assessment tasks. Jaeger suggests that judges make initial estimates of how well minimally-competent candidates are likely to perform and then have an opportunity to revise these judgements in the light of how well candidates have actually performed.

3.6 Some Suggestions for Standard Setting

Having reviewed some issues in standard setting, we now offer some general suggestions about the setting of standards in professions. Central to this paper has been the assumption that professions will wish to establish that candidates are minimally competent in a number of different areas of professional practice. We believe it will be desirable to set minimum levels

(standards) for each of these areas of competence. The setting of these levels is a matter of professional judgement and might involve the use of methods like those outlined above. The setting of standards for different areas of competence in a profession enables more useful feedback to candidates about the areas in which their skills are 'below standard' and so provides suggestions about what might be done to satisfy professional requirements.

We believe that a general verbal description of the level of competence required of candidates (i.e., the standard) should be developed for each area. This description should be accompanied by examples or illustrations that help clarify the description of that level.

While these general verbal descriptions of standards are important, we believe that standards must also be operationalised and interpreted in the context of specific assessment tasks. Suppose, for example, that a panel of experts developed a general description of the kinds of knowledge that a minimally-competent person should have in an area of a profession. This description would help clarify and make explicit the standard of knowledge expected of candidates. But this standard would have to be interpreted for any particular assessment of candidates' knowledge--using a procedure like the Nedelsky and Angoff methods, for example.

Similarly, a panel of experts might discuss what it means to be minimally competent in patient management and attempt to describe this standard in words. This standard would have to then be interpreted in the context of the particular medical cases that candidates were asked to manage. Candidates are likely to experience different levels of success on different medical cases, depending on their complexity and the frequency with which they are encoutered in practice. Whether a particular performance reflects minimum competence in patient management is a judgement that would have to be made by a professional panel.

Once a general standard has been established and described for an area of professional competence, and this standard has been interpreted and operationalised for some particular assessment tasks, candidates' performances on those tasks can be compared with the standard to decide whether they are above or below the minimum acceptable level of competence in that area. When this is repeated for all areas of professional competence, a profile of results for each candidate is obtained showing the areas in which he or she has been judged at least minimally competent.

The final step in the process is to decide, on the basis of a candidate's profile of results, whether or not that candidate should be registered for practice. The decision could be straightforward. It might be based on a requirement that a candidate demonstrate at least minimum competence in every area before being judged competent overall. Or the decision might allow strengths in most areas of competence to compensate for an inadequate performance in a

particular area, especially if the candidate's performance is only marginally below standard in that area. In view of the uncertainty that always surrounds judgements of competence in particular areas of professional practice, we believe that a decision process that allows compensation may be preferable to hard rules. In this case, there will be a role for professional judgement in this final step of deciding whether or not a candidate has demonstrated adequate professional competence overall and should be permitted to practice.

PART IV. CHOOSING METHODS OF ASSESSMENT

4.1 Principles of Assessment

There are many principles underlying good assessment practice. The principles that we consider important in developing a system of competency-based assessment for a profession are the following:

- The assessment process should follow the prior identification of a limited number of *areas of professional practice* in which candidates will be required to demonstrate at least minimum competence. Assessment procedures should be developed for each of these areas.

- For each area of practice, several *levels of competence* should be defined and described. We recommend at least three levels which might broadly be described as 'below standard', 'minimally competent', and 'well above standard'. Each of these levels should be described and illustrated where possible with examples of performance.

- Assessment tasks should be developed to provide information about the level of competence an individual has achieved in each of the identified areas of practice. This level will be *inferred* from the candidate's performance on the set of assigned tasks.

- Competency-based assessments are based on a *sampling* of candidates' performances on relevant assessment tasks. It is not possible or desirable to assess everything a person might need to know or be able to do.

- *Valid* competency-based assessments depend on methods of assessment appropriate to the skills being assessed. Valid assessments of psychomotor skills, for example, are unlikely to be provided by paper and pencil tests.

- *Reliable* competency-based assessment depends on the development of procedures which would lead to similar conclusions on different occasions, if different experts were making the judgements, or if slightly different methods were used.

- Assessment tasks should be chosen in an attempt to make the process fair, open and equitable for all candidates.

- Assessment tasks must make realistic and manageable demands on candidates and must be practical to implement and administer. They must also be capable of providing results in a reasonable period of time.

- The assessment process should provide information that will be useful for diagnosing areas of deficiency and indicating the need for bridging or remedial work.

The first two principles we have already discussed at length in Parts II and III of this paper. In brief, we believe that the only practical approach to competency-based assessment in the professions is for each profession to identify a limited number of broad areas of professional practice in which candidates will be required to demonstrate at least minimum competence and to assess candidates in each of these areas. Having identified key areas of professional practice, the next step will be to be as explicit as possible about what it means to be minimally competent in each of these areas. In describing and clarifying what it means to be minimally competent in an area, we believe professions will find it useful to also describe the characteristics of non-competent performance and, perhaps, highly competent performance.

Assessment as Inference

A candidate's level of competence in an area of professional practice cannot be observed directly, but must be inferred from his or her performances on some relevant tasks. It is useful to distinguish between a candidate's assumed (but unobservable) level of competence in an area of professional practice and that person's observed performance. Whatever the method of assessment used, performances are observed because they are assumed to be indicative of the attribute of interest:

> It is performance that must be measured in order to assess the attribute competence in the performer. Performance can be measured indirectly, as in a test or examination, or directly, as in observation of a physician in an actual clinical setting. Both types of measurement may be indicative of competence... (Burg, Lloyd and Templeton, 1982, 60)

For us, this distinction is important because it does not conflate competencies and tasks or treat professional competence as something that can be directly observed. Instead, it recognises that, at least in the professions, assessment is a process of inferring underlying competence.

Sampling Performances

Related to this, we believe that competency-based assessment in the professions must inevitably be based on a *sampling* of performance. It is not practicable or desirable to attempt to assess a pharmacist's knowledge of every drug that could be encountered in everyday practice. Nor is it feasible to assess a general practitioner's ability to diagnose and manage the variety of

medical cases that could be encountered in practice. We believe that much past practice in competency-based assessment has failed to appreciate the fundamental role that the sampling of performance must play in the assessment of occupational competence. Indeed, we question whether any occupation can be adequately and meaningfully represented as a comprehensive checklist of skills. Our recommended approach to competency-based assessment, at least in the professions, is based on the identification of broad areas in which practitioners must meet minimum standards of competence and on the sampling of performances from within these areas.

Validity

In a competency-based assessment system, the method of assessment must be appropriate to the kinds of professional activities being assessed. Another way of saying this is that assessments must be valid. The concept of *validity* in an assessment refers to the extent to which it meets the stated purposes and achieves its intended outcome. In other words, does the process assess what it aims to assess?

The issue of validity of assessments might seem an obvious matter, but it is easy to lose sight of it. A competency-based assessment that focuses clearly on the skills and abilities that constitute competence and the standards to be achieved for competence will continually consider the validity of the assessment methods and the results they produce.

The following questions focus on *validity* issues for the review of a competency-based assessment process.

Is the assessment:

- focused on the appropriate areas of competence and skills?
- sampling a sufficient range of the candidate's performance?
- of sufficient depth and intensity?
- indicating actual levels of skill or predicting actual performance?

In the course of preparing this paper we have sometimes been asked to identify the most valid method of assessing candidates in a system of competency-based assessment. We do not believe one method of assessment is necessarily or inevitably more valid than others. In general, we believe that face validity is likely to be enhanced by making set tasks resemble those encountered in day-to-day practice in a profession. But we do not believe that only assessments of performance on real workplace tasks are capable of providing valid information about professional competence. Simulations and indirect assessments, even with traditional paper and pencil tests, are capable

of providing valid information about some aspects of professional competence. We believe it is unlikely that any single method of assessment could provide a valid assessment of all important areas of professional practice.

Reliability

The concept of *reliability* in an assessment is concerned with the accuracy or consistency of the outcomes of the assessment process. Questions about the reliability of an assessment concern the extent to which an assessment would have the same outcome if different forms of the same test were used, different assessors made the judgements, different samples of the competencies were assessed, or different methods of assessment were used. Reliability is concerned with issues of variability in assessment. To what extent would the outcomes of the assessment process vary and why might they vary? What might be the sources of variation in assessment outcomes?

Statistical indices of reliability have been developed to accompany traditional testing techniques. Attempts to assess reliability in modes of assessment that require judgements of performance are usually based on correlations between the judgements made. Intra-rater reliability, or mark-remark reliability, is an index expressing the extent to which judges offer the same judgement of a test or performance on different occasions. Inter-rater reliability, or between-marker reliability, is a measure expressing different judges' agreement in assessing the same test or performance.

The following questions focus on *reliability* issues for the review of a competency-based assessment process.

Is the assessment

- likely to produce much the same result on a different occasion?
- an accurate assessment of the individual's professional competence?
- likely to produce different results if different methods are used?

There often seems to be a fundamental tension in assessment between validity and reliability, and it often seems that improving one of these aspects of a process has impact on the other. For instance, a focused and specific multiple-choice test of factual knowledge may produce quite consistent results across a range of different papers, but it may not validly sample or assess the professional skills and competence of an individual. Alternatively, a workplace assessment in which the candidate undertakes simulated or actual work may validly test skills and competence, but the assessments made may vary significantly as a result of different situations, problems and assessors.

In designing an assessment, validity and reliability should not be seen as opposing or mutually exclusive, because 'validity' without reliability is invalid

and 'reliability' without validity is unreliable. In developing an assessment, an appropriate and practical balance of validity and reliability has to be sought.

Fairness
It is self-evident that competency-based assessment procedures should be designed to be as fair as possible to different groups of candidates. It is important that all assessment procedures be accompanied by routine checks for possible bias against some candidates due to gender or cultural background.

When designing an assessment process it is important to consider what kind of information is to be generated and how that information will be reported. In assessing the competence of professionals it may seem that the only issue that matters is whether the candidate is judged to be competent, yet it is unlikely that such a decision will be based on a single judgement. Consistent with our view that there are various areas of competence in a profession, we expect that a candidate will be required to demonstrate competence in a number of different areas. Unsuccessful candidates should receive feedback indicating their estimated level of competence in each area, the areas in which they have not yet met the required minimum standard, and advice about what action might be taken to acquire the required skills.

4.2 Classifying Methods of Assessment

Before considering particular assessment methods it may be useful to reflect on some of the ways in which assessment methods can differ. The methods we discuss in this section differ on a number of dimensions:

- *Workplace versus Examination Centre*
  For some kinds of knowledge and skill, the most appropriate and practical approach is to set up a special examination or assessment centre. Assessments of this kind are usually carried out under secure and standard conditions. Other professional skills may be best assessed in the context of the workplace under conditions more like those encountered in day-to-day practice. *Contextualized assessments* of this kind might be made during supervised practice or during a period of probationary or limited registration.

- *Fixed time versus Unlimited time*
  When assessments are made under supervised conditions, they usually involve a time limit. Candidates are presented with a task or set of tasks to carry out in a fixed time. Workplace assessments are more likely to be conducted without time constraints and may be carried out on an ongoing basis over a period of time.

- *Restricted versus Unrestricted Access to Resources*
  Different assessment methods differ in the access they allow to resources and equipment. Workplace assessments usually assume unrestricted access to reference books and the tools of the profession (computers, measuring instruments, stethoscopes, and so on). Some assessment tasks allow limited access to resources which candidates may be permitted to bring to the assessment centre. Traditional examinations usually allow no access to textbooks or other resources.

- *Direct versus Indirect Assessment*
  It has been common practice, particularly in educational courses, to assess knowledge of facts, principles and procedures in the abstract. These facts, principles and procedures are assumed to be so fundamental and ubiquitous to professional practice that, for the purpose of assessment, they can be abstracted from particular problems and cases. Fundamental science learning in engineering courses and preclinical medical courses is usually assessed in this way. Assessments of professional competence that rely heavily on the assessment of abstracted knowledge might be described as *'indirect'* in the sense that they assume that learning of this kind is directly related to professional competence in the workplace, and they attempt to infer professional competence from mastery of basic knowledge.

  A more *'direct'* assessment looks at a candidate's ability to recall and apply appropriate facts, principles and procedures to address a real (or perhaps simulated) professional problem. In general, assessments requiring the application of knowledge and skills to realistic problems lead to more valid inferences about underlying professional competence.

In general, different methods of assessment will be required for different kinds of competencies. Paper and pencil tests and examinations can be efficient methods of assessing factual knowledge. But they are not the most appropriate methods of assessing candidates' abilities to carry out practical procedures involving a degree of psychomotor skill and they cannot assess interpersonal skills. For different areas of professional activity, it is likely that different assessment methods will be required. In Sections 4.3 to 4.8 we consider a variety of assessment methods that could be used in a system of competency-based assessment in the professions. Advantages and disadvantages of particular methods are canvassed and some of the issues that need to be considered in choosing among and implementing these methods are discussed.

4.3 Multiple-Choice Examinations

Multiple-choice examinations are most commonly used to assess candidates' knowledge of facts and understanding of principles. However, when they are

well written, multiple-choice questions (MCQ) can also assess 'higher-order' skills such as selecting an appropriate principle or procedure and applying it to a problem, using an understanding of several principles to develop an appropriate solution to a problem (for example, developing a mathematical formula for a new situation from first principles), and evaluating evidence and making judgements about the appropriateness or value of data.

When reviewing MCQ questions it is useful to ask:

- What kinds of skills are being tested?
- How clearly related to professional competence are the questions?
- To what extent do they test recall of information?
- To what extent is the recall of that information a part of or essential to professional competence?
- To what extent do the questions reflect the essence of the profession?

Multiple-choice examinations are an efficient way of assessing many aspects of a candidate's knowledge. But they are inevitably artificial in the sense that professionals are not presented with multiple-choice questions in day-to-day work; they are closed in the sense that they provide all the alternatives and do not require candidates to generate new responses or information. And they are indirect in the sense that they assess abstract knowledge and skills rather than the ability to apply knowledge and skills to the solution of day-to-day professional problems.

Although multiple-choice questions are often used in examinations, good questions of this kind are difficult to write and the standard of most multiple-choice questioning is low. Developing quality MCQ tests requires experience and skill in item writing, trialling, and revising questions on the basis of detailed analyses of how questions have functioned in practice. MCQ tests can perform consistently and reliably when they are developed well, but if they are not well developed, they cannot be depended upon and may be of dubious validity.

Once they are developed, MCQ examinations are relatively inexpensive and convenient to administer and score. They are uniform and standardised in the problems they pose and in the demands they make on candidates. MCQ tests are described as 'objective' because their scoring can be mechanical and unambiguous. However, there is always an element of subjective judgement in decisions about what to include in a multiple-choice examination and about what constitutes adequate performance on such a test.

In a system of competency-based assessment multiple-choice questions can be a valid and useful method of assessing candidates' mastery of important factual and procedural knowledge. They have the special advantage of being able to assess a candidate's mastery of a wide variety of facts and procedures

in a limited period of time. For this reason, they are likely to be especially useful as an element of the overseas skills recognition process.

Item Banks

Although item banks are not limited to multiple-choice questions, it is common to assemble banks of questions of this kind. An item bank is a collection of proven test or examination questions. These questions will have been used in testing programs and information will be available about how they function in practice. Each item in a bank is 'calibrated' according to difficulty. These calibrations reflect candidates' success rates across many different administrations of the item or group.

A bank of calibrated items can be used to construct a sequence of levels of increasing competence in the area of knowledge or skill covered by the bank. By studying where individual items stand in this sequence of levels, it is possible to develop verbal descriptions of these levels to produce scales similar to the ASLPR scale.

Once a scale of this kind has been developed for an item bank, a decision can then be made about the level on the scale corresponding to a minimum acceptable level of competence in that area of knowledge or skill.

If questions are drawn from an item bank for inclusion in examinations, then performances on each new examination can be related to the underlying bank scale. In effect, candidates' performances are adjusted for the difficulties of the bank questions included in the examination. This enables standards for an area of competence to be set in terms of the kinds of knowledge and skill required of candidates and to be maintained across different examination forms.

The statistical techniques (known as 'item response theory') that permit this form of standard setting and maintenance are in routine use in other parts of the world. They are used routinely, for example, by the national registration boards in nursing and medicine in the United States.

The steps in setting and implementing standards using an item bank are:

- collect information on candidates' performances on individual questions in a bank;
- calibrate each question (using specially-developed computer software);
- order items by estimated difficulty and study items at different levels on the difficulty scale to develop verbal descriptions of competency levels;

- decide on the level of competence representing the minimum acceptable standard of knowledge or skill;

- in future uses of questions from the bank, adjust candidates' results on these questions so that each candidate's examination performance can be interpreted in terms of the pre-defined competency standard.

If tasks are drawn from a calibrated bank, then information will be available about the relative difficulties of all tasks in the bank, and so a standard set for one test or exam can be used to determine the cut-off score corresponding to that standard on any other test or examination developed from the bank. The advantage is that the same standard can be applied to candidates taking different exams, and it is not necessary to go through the complete standard-setting process using a professional panel of judges every time a new exam is constructed. The National Board of Medical Examiners in the United States uses calibrated banks of examination questions as part of its process of setting and maintaining standards for licensing medical practitioners. The Board is also experimenting with the construction of calibrated banks of computer-administered patient management problems.

4.4 Written-Response Tests

Other paper and pencil tests provide opportunities for candidates to make written responses. These include short-answer questions, structured tasks, and extended answer questions such as case-studies and problems. An advantage of this format is that it assesses candidates' abilities to produce a relevant response (rather than simply identify a correct answer) and so provides an improved opportunity to collect information about a candidate's thought processes and solution strategies.

Short-answer questions can be used to assess the same range of knowledge and skills assessable with multiple-choice questions. In addition, they provide an opportunity to test factual information and comprehension in a way that requires the candidate to generate ideas and solutions rather than selecting a correct answer or eliminating incorrect alternatives.

A *structured task* is a series of short-answer questions relating to the same problem. Candidates are presented with a description of a situation and are then asked a series of questions about that situation. Unlike most multiple-choice and short answer tests, the questions in a structured task do not test isolated pieces of knowledge and skill. They are often inter-dependent and assess knowledge and skill in the context of the described problem.

Extended written responses can be used to assess candidates' abilities to develop a series of ideas in relation to a problem. Candidates might, for example, be required to produce an extended written response in relation to a client

management problem they have been set. The advantage of using an extended written response as the basis for assessing competence in an area of professional practice is that it is capable of providing information about complex sets of skills and can focus on higher-order thinking and problem solving strategies. Extended written tasks also give insight into the language and written communication skills of a candidate. The disadvantage is that extended written responses depend heavily on writing skills in English. For non-English speaking migrants, extended written responses can create special problems.

In general, written-response tests are much less difficult to construct and much more difficult to mark than MCQ examinations. As the number of candidates grows, extended written responses can become expensive because they depend on competent assessors. Because the marking of extended written answers involves professional judgements on the part of readers, this form of assessment is usually seen as less reliable than objectively-scored multiple-choice questions.

An example of an assessment task requiring extended written responses, taken from the third part of the Occupational Therapy Screening Examination developed by the National Office of Overseas Skills Recognition, is shown in Figure 6.

There is always a risk in written tests and examinations that they will assess only the ability to recall factual knowledge and procedures. One way of reducing the likelihood of this is happening is to allow candidates access to reference books. If test constructors know that candidates will be able to find answers to factual questions in a book, then they are more likely to write questions that go beyond the demonstration of factual knowledge to the assessment of students' understandings of key principles and their ability to use facts and procedures. Such an assessment may focus on the candidate's ability to think in the manner of the profession and so provide information consistent with the intentions of competency-based assessment. Open book facilities are currently offered in the Part II Viva Voce examination of the Australian Pharmacy Examining Council.

FIGURE 6: EXTENDED WRITTEN RESPONSE

Example: Occupational Therapy

You will be given a number of case study questions in the examination, and you will be required to choose a subject of your specialisation. A total of 45 minutes will be provided for the case study component of the examination, and you will be required to choose a question and provide a full written response during this time.

Case Study (Rheumatoid Arthritis)
Sarah, aged 30 is married with a 2-year-old son. She works as a computer programmer at a university. Sarah has had rheumatoid arthritis for eight years mainly affecting her hands, wrists and elbows. She is seven months pregnant and is reasonably healthy at present. Sarah has been referred to the occupational therapy department for splints and counselling as she is worried that she may not be able to cope when her baby is born.

On interview, Sarah is found to be a quiet, well-educated woman. She has insight into her condition and anticipates that she will have many problems when her new infant arrives. Sarah lives in a double storey old house which has had some modifications. Her husband is very supportive. Both Sarah and her husband would like her to continue working part-time, and there is a possibility that computer terminals could be installed at Sarah's home.

1. What essential information does the occupational therapist still require?

2. What are the implications of pregnancy on a patient with rheumatoid arthritis?

3. What advice would the occupational therapist give this patient regarding pain?

4. What type of splints might this patient require?

5. What functional aspects of adl would be important to this patient?

6. If the occupational therapist were to do a home visit, which aspects should be considered in view of the patient's disease and pregnancy?

7. What suggestions might you have regarding the care of her children?

Most paper and pencil tests are relatively indirect methods of assessment. The link between performance on a written test and performance in the workplace is usually more tenuous than the link between workplace skills and performances on simulations and realistic tasks. Nevertheless, the administrative ease and convenience of paper and pencil tests gives them important advantages. As Fitzpatrick and Morrison point out, there is little reason for developing a performance test if a suitable paper and pencil test can do the job:

> If an adequately relevant and otherwise suitable paper-and-pencil test is available or can be readily developed, there is no point in using or developing a performance test. However, the ready availability of paper-and-pencil tests has often blinded us to considerations of relevance. It is an exercise in futility to measure accurately something one does not want to know. Relevance is the primary consideration, and good measurement is only a means to the end of appropriate evaluation.
>
> (Fitzpatrick and Morrison, 1971)

Given the need for feasible and cost-efficient means of assessment, those who are designing a range of tasks must determine whether the methods they use assess the actual basis of work performance and job competence.

4.5 Oral Assessments

Oral assessments can be used to assess knowledge and skills, but they have the added advantage of providing opportunities to assess inter-personal and communication skills.

Oral assessments include situations in which candidate interact with assessors in an interview and so must 'think on their feet'. This can create pressures for candidates that do not exist with other forms of assessment. On the other hand, it could be argued that these pressures are not unlike those that professionals encounter in their day-to-day interactions with clients and colleagues and that oral assessments are uniquely capable of providing insight into these aspects of a candidate's professional competence.

A taped oral examination is used as the second of three parts of the Dietetics Examination conducted by the National Office of Overseas Skills Recognition. In this assessment, the areas of competence to be assessed and the criteria for assessment are indicated to the candidate. The assessment procedure and examples of the task are outlined in Figure 7.

Open-ended interviews can also be used in conjunction with other assessment methods. The Australian Pharmacy Examining Council uses interviews as a follow-up to their multiple-choice examination. When used in this way, oral assessments can give insight into a candidate's past experience in a profession

and be used to offer advice and counselling. When an interview is to form part of the formal assessment process, however, candidates should be told in advance at least the broad areas to be discussed, and an attempt should be made to clarify the criteria by which candidates are to be assessed.

The disadvantages of oral tests are that they can be difficult to make predictable and uniform. They can also involve peripheral and irrelevant personal issues that have little to do with professional skills.

We believe that, at least in some professions, oral assessments have an important role to play in a system of competency-based assessment. Some NOOSR panels have valuable experience in developing and using oral assessments. This experience is likely to be valuable to other professions considering including this mode of assessment in their procedures.

FIGURE 7: ORAL EXAMINATION

ORAL EXAMINATION AND CLINICAL CASE STUDY

This test is designed to examine your counselling skills. The oral exam will require you to record on tape answers to certain questions; the clinical case study component will require you to respond in writing to a written case study.

The Oral Examination (20 minutes duration)

- This examination consists of five short answer questions. The questions are stored on one tape recorder; your answer will be recorded on a second tape recorder. The two machines will be turned on simultaneously by the examination supervisor.

- The actual questions on the tape are preceded by a short introduction, the printed text of which is as follows:

> NOOSR DIETETICS ORAL EXAMINATION: Introduction
>
> "What is your name?" (please reply) - 5 second gap -
> "Where do you live?" (please reply) - 10 second gap -
> "In which city is this examination being held?" (please reply) - 5 second gap -
>
> "This examination is designed to test your counselling and communication skills. It consists of five short-answer questions. You will be allowed <u>two minutes</u> between each question to record your reply. After 90 seconds a warning will sound indicating that 30 seconds remain.
>
> For each question, consider the problems the persons concerned might have, and within the two minutes allowed discuss the situation as fully as you can as if you were counselling them personally.
>
> You may make notes on the scribble paper if you wish.
> Please speak in your normal tone of voice.
> The test begins now ..."

- An information sheet containing a copy of this introduction and a copy of the taped questions in printed form will be handed to candidates by the supervisor, 5 minutes before the start of the oral examination.

FIGURE 7: CONTINUED

- You must on no account take any paper into or out of the examination room.

- At the end of the oral examination, the voice on the recording will instruct supervisors to switch off both machines - you must on no account touch either recorder at any time.

- Candidates will be given a ten minute break prior to the start of the Clinical Case Study.

- Oral Examination Assessment Criteria

Each candidate will be assessed on both communication/counselling skills and on factual content. The communication/counselling skills criteria consider:

- whether the person inspires confidence; is the voice clear and concise; would this person relax patient tensions?

- how well does the person relate to the patient and the patient's problems?

- would the advice given be easily understood by the patient?

The factual content criteria consider:

- how relevant is the advice given?

- is the advice accurate, correct and complete?

- is the patient helped by the advice given?

Specimen Oral Questions

1. A woman with diverticulitis has for the past 10 years followed a low residue diet. Her doctor has now prescribed a high fibre diet. How would you explain this dietary change to her?

2. A science teacher asks you if restricting dietary cholesterol helps to prevent coronary disease. He is confused by conflicting media reports. Explain the facts to him.

4.6 Performance or Product Assessments

Performance or product assessments require candidates to undertake practical tasks in simulated or real situations. Candidates are assessed on their performance on a task or series of tasks or on the quality of the products they create.

This method of assessment provides information about candidates' abilities to carry out professional tasks by producing work. Knowledge and theoretical understanding are involved in these assessments, but they have a distinct emphasis on the manipulative and psycho-motor skills that can be a crucial part of professional competence. Performance assessments tend to focus on major professional tasks and to assess important skills in combination.

The case study questions shown in Figure 8 are kinds of performance assessments in test conditions that can be used for almost any profession. Candidates are given a scenario or task and are required to produce an interpretation, a response to the problem, or a recommendation.

In an even more realistic simulation of actual work, candidates in such fields as accounting, architecture, computing and engineering could be required to produce a plan, a model or a design.

Two examples of the use of performance assessments in the professions are shown in Figure 9. The first is taken from the final examination of the Australian Dental Examining Council. The second is taken from the supervised practice and subsequent performance test used by the Australian Pharmacy Examining Council. In the case of the Dentistry example, an interview is used in conjunction with the practical assessment to further explore the candidate's understanding of this procedure. This strategy of using more than one mode of assessment in combination is one that we believe other professions could usefully adopt.

The assessment of performances and products is, of course, time consuming, expensive, and may be difficult to organise. Assessments of this kind are difficult to constrain within uniform parameters, meaning that there can be difficulties in ensuring that judgements of performance are comparable and reliable.

Performance and product assessments are valuable components of a system of competency-based assessments. If properly designed, they are capable of providing valid assessments of realistic workplace tasks.

FIGURE 8: CASE STUDY QUESTIONS

Example 1: Dietetics

Case Study
Miss J C, a 15 year old schoolgirl, went to see the doctor at the local community health centre because of nausea and vomiting, particularly in the morning.

Miss J C reported that she had had a weight problem since she was 10 years old. Her weight peaked at 65 kg (143 lb) when she was 12 years old and by strenuous dieting she reduced to 54 kg (119 lb) when she was 14 years old. She became vegetarian 18 months ago, partly to keep her weight down.
Her weight is now 49 kg (108 lb) and her height is 165 cm (5 ft 5 in).
Investigations show that Miss J C is 9 weeks pregnant.
Results of blood tests include haemoglobin 11.1 g/DL and packed cell volume 35%.
Her family is supportive and she plans to keep her baby.
Miss J C is referred for nutrition counselling.

1. What further information would you require?
2. How can her nutritional status be monitored throughout her pregnancy?
3. What would be the objectives to the nutritional care of this patient?
4. What practical measures would you advise?

Example 2: Occupational Therapy

1. When setting up a room for group relaxation therapy what special environmental requirements would you need?

2. What activities would you include in a training programme for a group of mildly intellectually- handicapped people who want to live outside an institution?

3. What would you do if an obese elderly man with a below-knee ampuation needed to be transferred from his wheelchair to the toilet?

4. A patient, with a long history of alcoholism, wants to apply for a job in a brewery.

5. A new post office is to be built and you have been asked to advise on the access requirements of disabled people. What advice would you give?

FIGURE 9: PRACTICAL / PERFORMANCE ASSESSMENT

Example 1: Dentistry

Operative Dentistry

(a) Practical: using extracted teeth in a phantom head (manikin) mounted on a clinical chair, candidates are asked to cut a number of cavities, and place restorations of specified materials.

Preparations of cavities will be required to be carried out on teeth isolated with a rubber dam.

(b) Viva voce: candidates may be asked to discuss any one or all of the following:

- cavity forms
- pulp protection and occlusion
- choice of instruments
- choice of materials
- use of equipment
- protection of the patient
- general principles of operative dentistry

Example 2: Pharmacy

Part I - Practical Examination

The candidate will be required to make four (4) preparations in 3 hours.

The preparations will include at least one solution and will be examples of commonly encountered prescriptions. Preparations will be assessed on the basis of contemporary Australian standards of potency, stability and quality, and on the appropriateness of labelling and presentation. The assessment procedure may include a chemical analysis of one or all of the preparations.

Examples of the solution preparations are given below.

1. Prepare

   100 mL of a 2.0×10^{-3} M solution of Chlorpheniramine Maleate made isotonic with Dextrose.

2. Prepare

   A new potent antihypertensive agent, 'hypotensine', has been developed by an Australian company. You are asked to make a preparation of a non-sterile solution for preliminary testing 100 ML of an isosmotic solution containing 4.58×10^{-5} M 'hypotensine'.

   Data available:
   'Hypotensine' Molecular formula $C_{13}H_{20}N_2O_2.HCl$ MW = 272.8
   Soluble 1 in 1 of water, 1 in 15 of ethanol.

4.7 Work-Based Assessments

Work-based assessments are carried out while a person is working in a professional capacity, perhaps on limited registration or under supervised practice. Because work-based assessment can take place over an extended period of time, it can yield valuable insight into the overall performance and functioning of a professional. The candidate can be observed undertaking a wide variety of real tasks and much more reliable judgements about professional competence are possibly than with assessments conducted in limited time periods on limited ranges of tasks.

The disadvantages of this method of assessment are obvious. Work-based assessment is possible only if a decision is first made to place a candidate in supervised practice. As such, it is likely to be useful only as the last stage in the overseas skills assessment process. Supervision may be difficult to arrange and costly. Even then, assessments may be based on the judgements of only one assessor who may have limited experience in supervising similar candidates.

Nevertheless, work-based assessments are the most direct and realistic tests of competence, and they are a particularly useful method of assessment in areas such as the trades where a person can be assessed on an ongoing basis by their workplace supervisor.

4.8 Some Less common Methods

In addition to the standard assessment methods described above, a variety of less common assessment methods have been used in particular professions. These are mentioned briefly here to indicate some of the ways in which problem-solving and simulation tests might be developed and experiential learning might be taken into account.

The Tab Technique

This method was developed to test problem solving and diagnostic skills. The candidate is give a brief description of a problem, followed by a list of questions that the candidate may ask to gain further information. The aim is to make a decision or diagnosis by asking the minimum number of questions. If the first question leads to an impasse, the candidate selects another. In a formal test booklet, each answer can be covered by a tab and the removal of the tab records the number and kind of questions needed to arrive at a solution.

The In-basket Technique
This technique is generally referred to as a 'situational test'. The candidate is provided with the contents of an in-basket appropriate for a given job and is also provided with background information about the fictitious institution, staff, clients that she or he must work with. The candidate is required to respond to the problems posed by the material in the in-basket, the responses being memos, letters, phone calls, and so forth. These responses are evaluated - usually with the aid of previously-established scoring categories. (Thorndike, 1971, 243-5)

A Professional Portfolio
Such a portfolio is a collection of evidence of past experience and skills and can include products that the candidate has created. The portfolio can be submitted for appraisal or can be the basis for interview assessments. This method of assessment is referred to by Thomson in the discussion paper *The Development of Procedures for the Assessment of Experiential Learning*.

The major assessment methods reviewed in this section are summarised in Figure 10.

FIGURE 10: METHODS FOR ASSESSING COMPETENCE

Methods of Assessment	Distinctive Purposes and Uses	Advantages and Stengths	Disadvantages and Weaknesses	Practical Considerations
Pencil and Paper Tests				
Multiple Choice Tests	Factual and procedural knowledge Understanding of principles	Consistency and reliability Uniform and standardised	Assess ability to recognise rather than recall Difficult to use for problem solving and higher order thinking	Difficult to write Cheap and efficient to use
Written Responses Short answer Extended answer	Use of information Application of knowledge Generating ideas and solutions	Tests more complex set of skills Higher order thinking and problem solving	May assess language skill in addition to knowledge or competence	Difficulties ensuring reliable judgements Expensive to process
Oral Assessments	Interpersonal skills Interactive thinking	Assessment of thinking skills Multi-dimensional	Difficult to standardise Variable conditions	Problems with the reliability of judgements
Performance Product	Psycho-motor skills Functioning Ability to produce	Holistic and direct assessment of skills	Expensive of time and resources	Difficulties ensuring reliable judgements Logistical difficulties
Work based assessments	Overall performance and functioning	Directness, breadth,range of assessment	Duration Availability	Dependent on supervisor and supervisor's judgements

4.9 An Example of Assessing Performance in a Profession

To conclude this section on assessment methods we consider some of the approaches that have been used to assess the complex mix of skills that can be involved in an area of professional activity.

Clinical assessment in medicine
It is not surprising, considering the importance of psychomotor and interpersonal skills in the practice of medicine, that there has been widespread and longstanding interest in the assessment of clinical performance in that profession. Clinical assessment is a common part of assessment in medical courses, but there are continuing questions about the validity and reliability of such assessments. There have been many attempts to describe and define areas and standards of competence in medicine which have also involved attempts to improve the assessment of clinical performance.

The Report of the Cambridge Conference on the evaluation of clinical skill of doctors and medical students entitled *Directions in Clinical Assessment* described clinical skills in the following terms:

> Clinical actions are multifaceted, drawing upon knowledge, cognitive, clinical, technical and interpersonal skills, personal qualities, and attitudes as underlying components.

The Report notes that attempts to achieve consensus about the components of clinical skills and describe them in operational terms have mostly consisted of 'subjective' rating of 'global clinical actions', although redefinitions have been offered that do not cast the ratings in such a negative light. The Report also outlines assessment techniques targeting the components of clinical performance:

> Patient encounter portrayed by paper-and-pencil simulations, computer-based simulations, and simulated and trained patients, whether live or on videotape, are used frequently for assessment of clinical actions. However, the use of live simulated and trained patients mimics reality more closely that other available techniques.
>
> Although this approach presents its unique problems - e.g., patient availability, patient fatigue, patient inconsistency - it addresses more directly the issue of validity and relegates reliability to an appropriate status.

The Cambridge Report provides a useful summary of the characteristics, merits and limitations of common methods for the assessment of clinical skills. We include the Cambridge discussion here because it is one of the better discussions of these methods that we have encountered.

Long Cases
The examiners are given a card summarising a patient's history, abnormal signs, investigations, and diagnosis(es). The student typically has 30 to 60 minutes to examine the patient and arrive at a differential diagnosis, investigation and management plan. The student then presents this information to the examiner and may be asked to demonstrate the physical findings. Examiners, usually two, generally use no explicitly stated criteria but reflect their own internal standards in their assessments.

Merits: Long cases are couched in real life, thus they are credible and feasible. They sample most of the required skills listed and can deal flexibly with strong, average and weak students.
Limitations: Unevenness among examiners and patients, lack of uniform criteria, questionable generalisability, distortion by extraneous variables (eg student's confidence level, student's and examiner's personality, time of day) are among the most worrisome limitations. Physician-patient interaction skills are not generally examined.

Short Cases
The examiners are provided with a list of patients who are interesting clinical findings. The examiner and the student visit a number of these patients with the student being challenged to demonstrate specific skills relative to the findings.

Merits: This technique is also couched in real life, feasible, and provides a larger sample of clinical findings with which the students must deal. This approach is applicable to the entire range of students.
Limitations: The limitations are similar to those present in the long cases. This approach has an added disadvantage in that there may be only shallow coverage, or in some cases, no coverage of selected required skills.

Ward/Clinic Assessments
Assessments are provided by a consultant physician/surgeon or any combination of members of a clinical team, based upon their observations of a student's performance over a period of time (usually several weeks).

Merits: This approach has the potential to be comprehensive in the skills that are observed and assessed. It is couched in reality, and is feasible and flexible.
Limitations: Unevenness among evaluators and patients is rampant. Different students are observed with different patients by different evaluators. The effects of extraneous variables, eg personalities, time of day, loom large. Generally, due to the press of clinical and other responsibilities, there is lack of faculty time, interest, collaboration, and commitment dedicated to the evaluation task. Most faculty use implicit, general criteria in assessing students. If detailed criteria are available, they are usually ignored.

Simulated/trained patients in a Multiple-Station Format
The student interviews and examines a trained patient. The patient completes a carefully constructed (reliable, valid) checklist on the history obtained by the student, the physical examination pursued by the student, and the student's interpersonal skills. The student prepares a write-up which includes findings from the history and the physical examination, and a differential diagnosis. The student also suggests necessary investigations and consultations. The write-up is reviewed by a faculty member(s). (These steps may be repeated with other patients.)

Merits: This approach was viewed as focusing on all of the skills required to elicit a correct, substantiated diagnosis. The method demands well-defined criteria, sets explicit standards, and can provide a good sample of student's performance. In addition, the variability of examiners and patients is minimised.
Limitations: Any approach which has structure as an asset is in danger of having rigidity as a liability. The lack of flexibility in allowing for student variations in performance is seen as an inherent limitation. The approach has start-up costs which include faculty time to develop case protocols. Space requirements and scheduling conflicts were also raised as potential problems once the cases were developed. The issues of patient availability and patient fatigue were considered.

Medical Record (or Chart) Review
The most commonly used evaluation method for correct application of valid treatment is medical record review. Although many deficiencies have been identified with this method, it appears to be the best source of information regarding the application of treatment by clinicians.

Medical records are of two types, the source-oriented record (SOR) and the problem-oriented medical record (POMR) developed by Weed. The SOR is typically organised in the following way: presenting complaint, review of systems, results of the physical examination, differential diagnosis(es), investigations, and management. The POMR uses a standardised format which includes: a structured problem list; a data base consisting of problem specific information and other information relevant to the patient's problem; investigations, treatments and procedures, and patient education for each problem identified; and progress notes.

Merits: The medical record is an accepted part of clinical medicine by which actual performance and complete episodes of care can be evaluated. Explicit criteria can be applied and information can be reliably extracted. Large numbers of cases per examinee can be evaluated with relative ease.
Limitations: The validity of the medical record is questionable in that it is used as a memory aid rather than as an actual recording of all pertinent decisions and events. The inconsistency and incompleteness with which data are recorded present additional problems.

Alternatives: Rather than considering alternative evaluation methods, the emphasis should be on improving the medical record as an evaluation tool, so that the data recorded actually reflect the care the patient receives. Our view is that the medical record is currently underutilised as to its potential as an assessment device.

The assessment methods outlined above all aim to sample performance and professional competence. They range from the very realistic long cases to the structured and uniform chart review. A preference is expressed by members of the Cambridge Conference for the more structured and less realistic tasks, but in a competency-based system the limitations of the long and short cases and ward assessments can be mitigated.

Rater reliability is the critical issue in the very realistic tasks, but difficulties can be reduced by developing them within the parameters set by a competency statement that describes areas of competence, criteria for assessment, representative tasks and levels of performance. The reliability of such assessments will be improved if they take place as part of a documented procedure in which at least two initial assessments by different assessors are made and recorded independently, and there is a designated and recorded procedure for resolving discrepancies.

According to the Report, evaluators have as a result of their experience in clinical assessment recognised the limitations of any one technique and have followed the procedure we would recommend of combining the available techniques:

> Anderson and Botticelli used an objective test of knowledge, simulations to address problem-solving skills, a clinical skills examination with written standards and a criterion referenced rating scale to assess professional habits and attitudes. Littlefield and colleagues chose a multiple-choice examination, an oral examination, and ward ratings. Newble and colleagues describe an approach in which students rotate and perform various clinical tasks. This is in addition to a written section composed of free-response and multiple-choice questions. For Burrows, the preferred method of assessment of clinical actions is based upon the use of a combination of simulations couched in a 'multiple stations' format.

PART V. MAINTAINING AN ASSESSMENT SYSTEM

5.1 Choosing Assessment Tasks

In a system of competency-based assessment, any of the assessment methods described in Sections 4.3 to 4.8 could be used. As noted above, there are advantages and disadvantages to all assessment methods. In choosing the methods to be used in a profession, there will always be a need to balance competing demands and to make practical and reasonable trade-offs between different requirements.

The first and most important consideration in choosing an assessment method is the nature of the competency to be assessed. Some methods of assessment are simply inappropriate for the assessment of some skills. The 'soft skills' of inter-personal communication, negotiation and management cannot be assessed in pencil-and-paper tests. Manual dexterity and psychomotor skills cannot be assessed through tests of knowledge and theory, and attitudes, the most difficult thing of all to assess, may well elude assessment altogether.

Even so, trade-offs must be made, taking into account the range of considerations described in the introduction to the previous section:

- the relative ease of judging professional competence on the basis of formal paper qualifications must be weighed against the more reliable assessment that can be made by observing a candidate's performance on relevant occupational tasks;

- the relative ease of assessing theoretical knowledge must be weighed against the greater validity that follows from assessing the ability to apply knowledge to professional tasks;

- the greater validity of assessments made in the workplace in the context of professional practice must be weighed against the convenience of carrying out an assessment in a testing centre;

- the ease of scoring 'objective' tests must be weighed against the difficulty of constructing valid tests of this kind and the fact that they assess competence only indirectly;

- the difficulty of marking extended writing tasks reliably must be weighed against the ease of constructing tasks of this kind and the opportunities they provide to collect information about thought processes and problem-solving strategies.

In general, a move in the direction of competency-based assessment in the professions would seem to involve a greater use of more direct methods of assessment that more closely match the kinds of day-to-day tasks that professionals undertake. This implies less emphasis on multiple-choice examinations and more emphasis on case studies, patient management problems, extended written reports, and the assessment of products and work samples.

There are, of course, significant practical benefits to MCQ tests in that they can be inexpensive and convenient to administer and score. There are particular advantages in using MCQ tests for overseas professionals in that they are convenient in the initial or screening phase. They can be taken overseas and can give an indication of an applicant's standing before assessment methods are used that make greater demands on the applicant and the resources of the system. They may also place less strain on the English language skills of migrants than some other forms of assessment, such as interviews and extended written answers.

A move towards more direct forms of assessment, such as written work samples or case studies and direct tests of performance, has implications for the integrity and cost of an assessment system. The integrity of an assessment system depends on the extent to which the movement from less direct but objectively scored methods of assessment towards more direct but subjectively scored methods can be managed to ensure reasonable reliability to accompany greater validity.

5.2 The Role of Professional Judgement

A move away from more traditional objectively-scored tests of theoretical knowledge in the direction of assessments of workplace skills implies a greater role for observation and judgement on the part of professionals. A challenge in developing competency-based assessments in the professions will be to design procedures that maximise the reliability of professional judgements. This has implications for the training and support of assessors of professional competence.

There are a number of points in the competency-based system we are proposing where there is a need for professional judgement. The first is in the process of deciding the areas of professional functioning in which a person must satisfy at least minimal levels of competence and the standards on which judgements are to be made. There is also a need for professional judgement in interpreting what the minimum acceptable levels of competence are in respect to particular tasks and combinations of tasks. Our concern at this point is with the role of professional judgement in the observation process itself.

When candidates undertake assessment tasks, some record of performance is made. It is on the basis of this record (data/observations) that an overall decision must be based. Observations can take a variety of forms, including scores on an examination, ratings of performance on a task, or a written record.

Scores on a multiple-choice examination do not depend on professional judgement: in fact, multiple-choice examinations can be scored by machine with minimal human intervention. But many other ways of recording performances depend on human observation and professional judgement. The record might take the form of a supervisor's rating (e.g., on a 5-point scale). Such a rating might be appropriate for recording a candidate's performance on a dental task, or the appropriateness of the treatment initiated by a physiotherapist, or the quality of a pharmaceutical preparation. In each of these cases, the record of performance requires a professional judgement.

There is, of course, considerable expertise in the professions in judging the qualities of candidates' performances, both through the formal education process and through the clinical and practical assessment processes of the professions. A high level of professional expertise is required to assess the work of others. Being an expert in a profession is essential, but is not enough. It is also important to have some level of expertise in the assessment process and, particularly, to be aware of the range of skills and abilities that can be expected of overseas candidates and of Australians already practising in the profession.

Those with experience in assessing competence in their profession will not have naive notions about standards and will be aware of the uncertainties involved in assessment. Experienced assessors should be aware of:

- difficulties of different tasks;
- allowable variations in approach;
- the range of abilities found in the profession; and
- their own preferences and predilections.

If, as we believe is the case, a move towards a competency-based approach to assessment requires increased observation of candidates' abilities to perform realistic professional tasks and hence a greater role for professional judgement in the assessment process, then the question of the reliability of assessors' judgements becomes important. The use of professional ratings of performance has a long history, and the assessment literature contains a great deal of advice on ways of improving the reliability of judges' assessments.

Reliability of performance ratings can be improved by providing assessors with an 'assessment record' that specifies the nature of the task to be undertaken and the conditions under which it is to be assessed. It is sometimes useful for assessors to record their judgements of various features of the performance on a checklist or grid, and to describe the critical features of the performance that determined their overall rating of the performance.

Reliability is also improved by using multiple assessors. It is usual to have assessors give independent ratings of a performance. Each assessor might complete an assessment record and determine a rating. These independent assessments are then compared, and similarities and differences noted. Whenever multiple ratings of a performance are made, discrepancies can be expected. Common methods of dealing with discrepancies are to simply sum or average ratings (as in the judgement of gymnastics and diving competitions), to seek a further opinion to resolve a deadlock between two assessors, or to ask assessors to review their assessments and to negotiate a consensus decision. In this last method, assessors might later review the performance jointly, and discuss their separate assessment records. This process can be helpful in clarifying and reaching agreement on the criteria for judging performances.

In our opinion, professional judgement must play an enhanced role in any attempt to implement a system of competency-based assessment in the professions. The use of assessment records by multiple assessors of candidate performance can improve the reliability of performance assessments and help make the bases of professional judgements more explicit. Assessment records provide permanent documentation of the judgements made and can be used as the basis of reporting to the individual and to review assessments in cases of appeal.

In summary, the reliability and validity of expert judgements of candidate performance can be enhanced by an assessment system in which

- assessments are made by more than one expert judge;
- initial assessments are made and recorded independently;
- independent judgements are then compared;
- discrepancies between assessments are dealt with either by combining ratings, seeking another opinion, or asking assessors to achieve a consensus position.

5.3 Designing an Assessment Process

In this section we have addressed a range of issues and options in the assessment of candidates' levels of competence. Competency-based

assessment depends on a prior decision about the areas of professional work in which a candidate will be required to demonstrate at least some minimal standard of competence (see Part II). Once the areas of competence to be assessed are clear, the task becomes one of designing appropriate assessment instruments to collect data about candidates' levels of competence in each area.

In the assessment of overseas professionals, there are various constraints on the assessment process. Initial applications to the National Office of Overseas Skills Recognition are often made by intending migrants not yet in Australia. It is thus desirable that the assessment process occur in stages, with the possibility of initial screening tests prior to arrival in the country. This has implications for the extent to which it is feasible to use assessments of performance early in the process. Initial screening tests almost certainly will be of a paper and pencil kind aimed at a relatively indirect assessment of candidates' professional competence, although the dietetics and occupational therapy examiniations of NOOSR attempt to overcome these limitations by using case studies recorded on audio tape.

The issue of proficiency in the English language also takes on a special importance in the assessment of overseas professionals and must be taken into account in choosing among alternative assessment methods.

There is also a constraint in that assessments of overseas professionals are necessarily of a 'summative' kind. They must be conducted over a relatively short period of time and must lead to an efficient decision about a person's professional competence. In this sense, they have more in common with final-year examinations than with the ongoing 'formative' assessments of students throughout a professional course. As a result, they cannot attempt to be comprehensive. They cannot assess everything that a competent professional should be able to do. Instead, decisions about professional competence must be based on a candidate's performances on an appropriate sample of tasks.

In the light of these and other constraints, the questions facing those responsible for designing an assessment process for overseas professionals include:

- *What is the best (most valid) approach to assessing candidates' levels of competence in each area of learning?*

  Here the options include the various assessment methods outlined above. In general, the most valid assessment method will be the method that comes closest to requiring performances of the kind required in everyday professional practice.

- *How feasible is it to implement this method of assessment for overseas professionals?*

The most valid method of assessing knowledge of facts and procedures may be to present the candidate with realistic tasks requiring the recall and use of those facts and procedures. But it may not be feasible to present candidates with realistic tasks on an initial screening device to be used at multiple sites throughout the world.

- *If the most valid method is not feasible, what are the alternatives?*

  Inevitably, decisions about the methods of assessment to be used will be based on trade-offs. Given the constraint that an assessment must be conducted overseas, the only feasible method of assessment may be a more indirect paper and pencil examination.

- *Where should the assessment of this area of competence be conducted?*

  For some methods of assessment, it will be desirable to set up special assessment centres and have tasks completed under supervision. For others, particularly those that involve the observation of candidates' performances on realistic tasks, it may be more convenient to conduct the assessment in a laboratory, clinic, hospital or other work setting.

- *Having chosen a general method of assessment for a particular area of competence, what tasks should be included?*

  Having decided that a series of simulated patient management problems is the most feasible method of assessing candidates' levels of competence, what sorts of medical cases should be presented? Clearly, a candidate cannot be presented with a large number of cases. An inference must be drawn about his or her level of competence in patient management on the basis of a limited sample of cases. But a decision might be made that this sample should include at least one case from each of several areas of practice. Similarly, having decided that a paper and pencil examination is the most feasible way to assess knowledge of a particular area of engineering, a decision must be made about the tasks (examination questions) to be included.

- *How will performance on the assessment tasks be recorded?*

  In an examination, a decision might be made to score questions right or wrong or to use a system of partial credit scoring that gives some credit for partial success on a question. If the task is a performance (e.g., dental work), then a decision must be made about how the quality of the performance or the final product will be recorded. This will inevitably involve expert judgement and might require the assessor to note aspects of the performance/product on an assessment form and to make an overall rating of the work, perhaps on a 5-point scale (e.g., A to E).

- *If an assessment is to be based on professional judgement, what will be done to maximise the reliability of assessments?*

  Is it useful to develop a record form for the task? If so, what aspects of performance on the task might judges note and record? How many judges should assess a candidate's performance on the task? In general, the use of record forms, multiple assessors, and a system for addressing discrepancies will enhance reliability of professional ratings.

5.4 Organising and Implementing an Assessment Process

Those responsible for making assessments should see themselves as designing an assessment process from the Candidate Information Bulletins through to the Assessment Record forms.

Candidate information
The assessment processes for a profession must be fully and clearly documented. Candidates need background information about the profession, the professional education and the relevant bodies for registration in Australia. As staff in overseas post may be the first source of information for many prospective professional migrants, the comprehensiveness of the documentation of the tests for overseas professionals is particularly important.

Counselling for overseas professionals
As well as the documentation needed to inform prospective candidates, those designing an assessment process must consider the kind of advice and counselling prospective and actual candidates will need. The Government's Agenda for a Multicultural Australia describes the services needed as requiring the 'development of information, counselling referral services, including pre-departure counselling, preliminary assessment and post-arrival counselling and referral.' The closer these services are to the assessment process the better.

Candidates should be given detailed information about what will be assessed and how it will be assessed. The assessment process must generate information to explain the results for candidates, and where candidates fail to pass, assessment information must be reported to the candidates about the reasons why they did not pass and the weaknesses in their performance revealed by the assessment.

Bridging and remedial courses
Those who are designing an assessment process should consider the issue of bridging courses which may be necessary for candidates to gain professional recognition. This will be facilitated by a competency-based system which will

describe the skills needed for recognition and should be able to describe the ways unsuccessful candidates did not perform satisfactorily and the competencies they need to develop or refresh. A satisfactory reporting procedure for failed candidates will allow those candidates to remediate weaknesses in performance.

Appeal procedures
An assessment process should also involve uniform appeal processes which allow candidates to review the reasons for unsatisfactory performances and address the issues involved. An appeal procedure might involve candidates requesting that results be checked, or candidates may make a case to have certain results reviewed.

Time
The demands made of candidate's time and resources by the assessment system should be considered in designing an assessment process. The opportunities for assessment should take place as frequently as possible in as convenient locations as possible, and the results of assessments should not be subject to long delays and backlogs.

5.5 Developing and Maintaining an Assessment System

Up to this point we have largely addressed such issues as validity, reliability and cost from the viewpoint of those designing assessments in a particular area. We will conclude this discussion by considering these issues in general for an assessment system covering the range of professions.

The kind of competency-based system we have outlined will include the cost of an initial phase in which competencey statements are developed. It will mean movement away from the comparative assessment of qualifications into direct assessment of competence in simulated or realistic performances. As has been suggested above, more direct and performance assessments are usually less convenient and more costly than less direct methods such as MCQs and other pencil and paper tests. In our view increased resources needed to develop competency-based assessment will be justified by the increased validity of the system. The resources involved need not be prohibitive, and a competency statement for a profession will significantly facilitate the design of assessments.

NOOSR currently has access to considerable expertise in the assessment of performance through the various professional bodies and through the NOOSR Panels. On the basis of a competency statement NOOSR Panels will be able to review their current assessment methods to see how well they reflect the tasks, skills, kinds of knowledge and areas of practice which were described as necessary for minimum competence in the competence statement for their profession. In some cases this will involve adjusting and redesigning current

assessments, and in others it will the addition of more direct assessments. Competency statements will be an excellent basis on which to review and improve assessment instruments.

As was suggested above, the direct assessments of performance in a competency-based system should be rationally designed or rationalised so that the criteria on which judgments are made are clearly specified and documented in specific detail. The validity and reliability of the system will depend on such support being given to those who make assessments, but such documents and procedures should not make an undue call on resources.

It is important that the competency statement for a profession and the standards used in assessment be monitored and reviewed. Such a process will mean that they remain valid and are improved over time. The assessment process should be informed by and should in turn feed back into the competency statement of a profession.

As in any major assessment system, there will be a need to continually review asessment procedures for their ongoing relevance, reliability and validity. Item banks provide a valuable resource to professions for the development of comparable assessment instruments over time, and we recommend that all professions consider the construction of secure banks of tasks on which they can then draw.

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The following sources are referred to in our discussion of competency-based assessment. There is an extensive literature on this topic, particularly coming from the United States in the 1960s and 1970s. While it was useful to look at some of this material, and we refer to it it in Part II, none of that material is directly enough related to the way competency-based assessment is developing in Australia in the 1990s to be worth recommending to the reader with a general interest in the issues. The material we refer to from the United Kingdom in the 1980s does relate to recent developments in Australia, but none of the texts we have consulted are really suitable for the reader interested in a general introduction to the topic as a way of beginning work in their own profession.

The two publications commissioned by NOOSR should provide a general introduction to competency-based standards and assessment. Rather than reviewing the more general texts we have consulted in writing this paper, it may be more useful for professions to use the conceptual framework offered by the two NOOSR papers as a basis for exploring the literature on describing and assessing competence, particularly in profession-specific journals. A good deal of work has been and is being done to define what should be assessed and how it should be assessed in each profession. We expect that this work will offer the basis on which competency-based assessment will be most usefully developed in the future.

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