Competent / Not yet competent: what does this mean in a manual handling training program?

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Introduction

Vocational education and training (VET) in Australia is increasingly focussed on reliable and valid assessments of competence. This paper addresses these issues in a niche market vocational training system and reports on the initial findings from the development of a standards reference framework to assess and report outcomes associated with manual handling skills training.

Context

This research is based in a community of practice – the Australian Association of Manutention Practitioners (AAMP). AAMP offers two streams of manual handling training courses: one for general industry and the other for the health care industry. The course work, recognised in Australia and New Zealand by the word, Manutention, has its genesis in a didactic French psychomotor skills training course developed by a physiotherapist, Paul Dotte. Through his training organisation, SIFAM - Formations, the French courses were first offered in Australia in 1989. Founded in 1991, AAMP is an incorporated, not for profit organisation, managed by a voluntary national committee.

The training has a vocational outcome. However the articulation of the competency standards and the reliability and validity of the assessment processes cannot be rigorously defended. This places a question mark over the viability of AAMP in Australian workplaces and negates any lobbying for recognition of skills training as a preventative occupational health and safety strategy in both the political and educational arenas.

Therefore the research questions to be addressed are:

- To what extent can the competency standards be articulated using the Manutention construct and competencies from a variety of Training Packages?
- To what extent can a standards reference framework be applied to define the underlying competencies and to determine varying levels of achievement?
- To what extent can the assessment evidence be reliably interpreted and the judgements of competence validated using a standards referenced framework?

To explore these questions this project explores the nature of manual handling and the alignment, rather than inclusion, of the training within the formal Australian VET context.

It further investigates the articulation of the standard and the development of a standards reference framework for the AAMP assessment protocol. This is a work in progress.

The nature of manual handling

Manual handling is defined as any activity requiring the use of force to lift, (lower), push, pull, move, carry, hold or restrain any person, object or animal. (Manual Handling Regulations Vic 1999).

The impact of manual handling injuries

The human and financial cost of manual handling injuries (also known as work related musculoskeletal disorders and body stressing) to Australia is immense. Table 1 collates data from the Victorian WorkCover Authority (VWA 2003) and it provides a representative profile of the situation across Australia currently and also for the last decade.

	Date	No. of MH claims	% of total claims	Total cost $m	Av cost per claim $
VWA	2001/02	15,297	47.9	496.1	9,809

Table 1. Victorian WorkCover Authority data (2003)

It is estimated by the National Occupational Health and Safety Commission (NOHSC) (2003) that lost time and compensation for manual handling injuries costs the country $9.5 Billion per annum.

English speaking countries have adopted prevention strategies that follow a risk management approach of spotting hazards, assessing risk, implementing controls and evaluating the results (see OHS Act Victoria 1985 as an example). The notion of manual handling as a skill has been ignored.

This situation has arisen because most research in manual handling has its genesis in ergonomics and bio-mechanics where researchers are concerned with isolated load loadings, particularly those on the lumbar spine (Karwowski & Marras, 1999). In Safe and Effective Lifting, in which findings from a number of consensus meetings held in Australian capital cities are reported on, Sedgwick (1993) states:

> The nature of skill acquisition in lifting is new to this discussion and still attracts little scholarly attention even though it is of paramount importance (p132).

Unrecognised or ignored in the English language debate is the work of Gendrier, a Swiss professor of both physical education and occupational

health. Dotte, and subsequently AAMP, draws heavily on Gendrier's (2000) construct of ergomotricité (ergomotricity) which he defines as a set of psychomotor habits that enables work to be done with comfort, security and efficiency.

Motor skill theory and research

Changes of behaviour, psychomotor habits and the need to outline, understand and apply principles are well recognised by educational theorists and psychologists as fundamental to learning and skill development (Cornford, 1999; Guthrie, 1952 Schmidt, 1991).

There is also vast body of research literature to draw on in a discussion of the theory of motor skill acquisition. Two early and prominent theories were espoused by Fitts (1964) and Bandura (1977).

Much of the subsequent research is an extension of these theories. Shea and colleagues (2000) investigated outcomes from observational practice and physical practice for retention and transfer of learning and Hynes-Dusel (2002), Cornford (1999), Magill (1998) and Schmidt (1991) researched the sequencing of practice sessions.

More recent work undertaken by Wulf et al (2000, 2001, 2003) offer significant evidence to show that focussing the learner on the outcome (external foci) rather than their own body parts (internal foci) resulted in better retention of skills.

Another area of motor skill acquisition research worthy of consideration is that associated with the passage of the learner from novice to expert (see Cornford 1999). Dave (1970), Harrow (1972) and Simpson (1972) offer taxonomies in the pyschomotor domain based on Bloom's (1964) work in the cognitive and affective domains and a recent extension of these is that from the University of Mississippi (2001). This taxonomy is relatively simple and uni-dimensional but provides a continuum of development.

It is important to note that much of this research and the literature that was reviewed is based in skill acquisition associated with sporting activity or rehabilitation rather than on a preventative strategy of improving on "normal". One exception of considerable importance to this discussion is the work of Richardson, Jull, Hodges, & Hides, (1999). They demonstrated that for stability and safety of the spine under load, it is necessary to ensure that one has the necessary skill to activate psychomotor control of the spinal stabilizing muscles in unloaded situations.

The application of the theories and research to AAMP

The pedagogy and methodology inherent in Manutention training attests to Dotte's intuitive mastery. The courses meet the criteria now being promulgated as necessary for motor skill acquisition.

Unfortunately, however, the value and place of skills training remains a contentious topic in any debate regarding manual handling training although AAMP has increasing evidence for its efficacy at both an individual and organisational level.

Training and credentialling implications

AAMP, as a community of practice, conforms to Wenger's (1998) construct of community. It has a shared repertoire, mutual engagement and joint enterprise.

Over the last 5 years, through joint enterprise, the community has aligned the coursework to the Australian Qualifications Framework (ANTA, 2001). Initially this was undertaken with a view to accrediting the course work as a Training Package to be delivered by those training organisations whom meet the requirements of the Australian Quality Training Framework (ANTA, 2001), however, for a number of reasons, it was decided to remain an aligned but independent community of "best" practice.

To promote the "best" in practice the assessment protocol must be rigorous and defendable and, to date, the protocol has been lacking.

Assessment of manual handling skills

The assessment protocol of SIFAM and hence AAMP is based on expert judgement of a practical demonstration of a task during the training occasion. The evidence provided is supplemented by written tests, peer review and ongoing observation throughout the training.

To comply with accepted assessment principles, AAMP has expanded the Level 3 assessment to a workplace assessment of the trainee delivering a manual handling training session based on Manutention. At Level 4, assessment occurs within the community of practice and triadic assessment of higher order competencies: problem solving, communication skills, management skills [particularly reflective practice and conflict resolution] and attitudes (Hager & Gillis 1995) is undertaken.

Ergomotricity is the skill acquisition unit within Manutention. It is assessed at all levels through demonstration and application.

In taking these assessment activities and melding them into a coherent protocol that can be defended, Masters' (1994) probabilistic model of competence has been used as a framework and extended in this project.

Defining areas of competence

Competency comprises the specification of the complex combination of knowledge, skills and attitudes required for successful performance in the workplace (Masters & Curry, 1990).

Within the genre of a Manutention trainer success equals competence in aspects of occupational health and safety, ergonomics, front line management

and adult education and the core ergomotricity elements that are Manutention. It is this cross industry notion with underlying generic domains of competencies that places the work of AAMP outside the norm; some preliminary work is being conducted in this arena by the Victorian Qualifications Authority (Noonan 2003).).

An additional challenge is that although, in most circumstances, it would be unusual to find a large discrepancy of performance across the units of a related set of competencies, there is evidence of differences across the competency domains that have been packaged to form the Manutention qualification under the requirements of the AQF. This becomes strategically important when considering the place of the recognition of current competencies and or prior learning in the assessment protocol as the system must be able to highlight ergomotricity deficiencies in the otherwise competent manual handling trainer.

The following matrix displayed in Table 2 has been developed for the purpose of this research and proposed to AAMP.

AQF equiv Level	OH&S	Ergomotricity (skills)	Adult Education	Front line management
2	Legislative compliance worker level	Skills for self FP&A Neutral spine		
3	Legislative compliance Supervisor level	Focus on the client in health Focus on hazardous manual handling in loads Problem solving	Train small groups Conduct Assessment	Organising training opportunities Co-training Training in own workplace
4	Legislative compliance Manager level	Analysis/ Complex problem solving in health & loads	Cert IV Assessment and WT BSZ40198	Marketing / Running a consultancy or department
5	Components of Diploma OH&S	Research	Management of Training & Assessment system ie AAMP through m'ship of committees	AAMP National Committee Managing RTO

Table 2. Competency matrix for Manutention

Mapping developing competence and interpreting levels of competence

Using the notion of increasing ability on a continuum of the competency, a criterion referenced assessment protocol was applied across all the domains and mapped to established development taxonomies of skill acquisition using

those given by the University of Mississippi (2001) and Butler's (1966) Performance levels.

This was further developed into a standards referenced framework, a type of criterion referencing whereby levels (or bands) are defined along the progression for interpretive purposes (Griffin & Gillis, 2001).

Standards have been articulated for all levels and the Level 3 standard is given as an example.

Level 3: At this level a person plans and organises a manual handling training session that conforms to their organisation's OH&S policy and procedures. In training the staff the person models, teaches and assesses self protective behaviour, caters for the differing learning styles of the students and provides opportunities for skill acquisition.

Item response modelling

To analyse data it has to be collected, scored and measured against a pre determined scale. Griffin and Gillis (2000) describe assessment as a series of steps that include observation, coding, recording, synthesis, interpretation and inference.

Item response modelling (IRM) allows for the simultaneous calibration of persons (candidates) and objects (test items, assessment tasks) by conceiving that persons and objects can be measured using the same unit of measurement (Griffin & Gillis, 2000). Members of the Assessment Research Centre at the University of Melbourne (for examples see Griffin & Gillis. 2000;, Gillis, 2003; Bateman. 2003,) have utilised IRM procedures in a number of vocational education and training research projects to calibrate and test the psychometric properties of the assessment instruments. The application of IRM to this research draws heavily from their experience.

It is the contention of this paper that the latent trait to be measured is the competencies required to be a Manutention trainer and the standards previously discussed are the thresholds that delineate one level of performance from another along the developmental continuum.
The following section reports on the outcomes of the initial set of pilot studies that involved the development of the items, the scoring rubrics and the analysis of one item.

Pilot projects

The first activity; The development and testing of a scoring rubric using item response modelling for the level 3 assessment.

Assessment at this level has to be able to pin point the ability (or non ability) of the person to demonstrate specific skills that relate particularly to the construct of ergomotricity. This is achieved in the development of a matrix and

performance rubric. These are the scoring criteria that are used to judge the quality of the evidence provided in the assessment (Bateman, 2003).

To date, data has been collected on 10 occasions of use, 2 as part of the development, 6 from assessment opportunities and 2 in conjunction with Certificate IV Workplace Assessment and Training Assessments

Early results (Table 4) indicate the rating tool is able to differentiate between competent and not yet competent trainees. It would appear to support the expert judgement of the assessors and it may have implications for the borderline situations where judgements may be biased. In case 10 the assessor acknowledged that the relationship between the assessor and the trainer influenced the outcome.

Candidate No	**Assessor initial**	**Assessor rating** **1. No for MH** **2. No for AAMP** **3. Borderline** **4. Yes** **5. Yes +**	**Score**
1	4	5	22
2	4	2	15
3	1	3 → 4	17
4	1	5	23
5	1	4	19
6	1	5	22
7	4	2	12
8	4	2	10
9	2	5	23
10	3	3 → 4	14

Table 4. Early results Level 3 assessments

The second activity: The use of Quest (Adams & Khoo 1993) to analyse a test item.

The IRM model was used to calibrate a questionnaire designed to measure one's ability **to interpret OH&S law as it related to manual handling in the workplace (the latent variable).** The questionnaire was administered on a cohort of subjects (n=216) whose ability was thought to range from novice to expert on the continuum. The scored assessment instrument measured basic knowledge and application of OH&S law (Level2) and was supplemented with questions that required more detailed knowledge and understanding of the intent of the law and its interpretation at a management level (Level 4).

There are two item types in the instrument - open ended and multiple choice.

To obtain a variety and number of responses the questionnaire was administered to peers and trainees in both formal courses and short manual handling training sessions that included an OH&S component.

Rasch analysis using QUEST allows the relative positions of person ability and item difficulty to be plotted on a single scale (Griffin, 2000). The following shows the QUEST Item Fit Map, Table 5, for this activity.

```
------------------------------------------------------------------------------
Item Fit                                                        3/ 6/2003 19:41
all on all (N = 260 L = 19 Probability Level=0.50)
------------------------------------------------------------------------------
INFIT
 MNSQ       0.63      0.71      0.83      1.00      1.20      1.40      1.60
--------------+---------+---------+---------+---------+---------+---------+-
    1 item 1                 .            * |              .
    2 item 2                 .              | *            .
    3 item 3                 .           *  |              .
    4 item 4                 .  *           |              .
    5 item 5                 .*             |              .
    6 item 6                 .         *    |              .
    7 item 7            *    .              |              .
    8 item 8                 .        *     |              .
    9 item 9                 .           *  |              .
   10 item 10                .     *        |              .
   11 item 11                .         *    |              .
   12 item 12                .              *              .
   13 item 13                .              |      *       .
   14 item 14                .              |          *   .
   15 item 15                .              |    *         .
   16 item 16                .            * |              .
   17 item 17                .              |              .   *
   18 item 18                .              |     *        .
   19 item 19                .              |              .     *
==============================================================================
```

Table 4: Quest Item fit map

In this model fit statistics indicate how accurately or predicably data fits the model. Items 7,17 and 19 do not fit the model. Item 7 asked “where does training fit in the hierarchy of control?” This shows a pattern of overfit – this means that the item was too discriminatory and could only be answered by subjects of high ability. Although it could be argued that the distractor was a language issue, all of the subjects who ranked at the competent + end of the continuum scored on that question.

Items 17 & 19 are on the other side of the “tram lines”. These items show under fit in that subjects’ chances of success on the items do not relate to their ability. Further analysis showed that many guessed on one item and the scoring was flawed on the other.

After re scoring the items further analysis was undertaken. Table 5, the variable map, plots the subjects and their ability and tasks and their difficulty on an increasing continuum of latent ability (competency) - the understanding of OH&S law relating to manual handling.

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Sample Run One: OH&S questionnaire
------------------------------------------------------------------------------
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Item Estimates (Thresholds)                                   3/ 6/2003 19:41
all on all (N = 260 L = 19 Probability Level=0.50)
-----------------------------------------------------------------------------
  4.0                              |
                                   |
                        XXXXXX     |
                                   |
                                   |
                                   |
                                   |
  3.0                              |
                           XXX     |
                                   |
                                   |
                        XXXXXX     |
                                   |
                            XX     |       14     15.4
  2.0                              |
                        XXXXXX     |        7
                                   |        1.2
                      XXXXXXXXX    |
                                   |       13.2
                           XXXX    |
                    XXXXXXXXXXX    |       12     17
  1.0               XXXXXXXXXXX    |       15.3   18.2
                                   |
              XXXXXXXXXXXXXXXXX    |       18.1
                XXXXXXXXXXXXXXX    |
                      XXXXXXXXX    |       10
         XXXXXXXXXXXXXXXXXXXXXXX   |        8     19.2
  0.0          XXXXXXXXXXXXXXXXX   |        4
                                   |       15.2
          XXXXXXXXXXXXXXXXXXXXXXX  |        1.1
             XXXXXXXXXXXXXXXXXXX   |        5     15.1
           XXXXXXXXXXXXXXXXXXXXXX  |
                                   |        3
             XXXXXXXXXXXXXXXXXXX   |        6     19.1
 -1.0            XXXXXXXXXXXXXX    |        9     13.1
                                   |
                  XXXXXXXXXXXXX    |
                                   |
                    XXXXXXXXXXX    |       11
                                   |        2
                      XXXXXXXXX    |
 -2.0                              |
                                   |
                            XX     |
                                   |
                                   |
                                   |
                           XXXX    |
 -3.0                              |       16
                                   |
                                   |
                                   |
                                   |
                            XX     |
                                   |
 -4.0                              |
-----------------------------------------------------------------------------
Each X represents    1 students
```

Table 5 QUEST variable map

The analyses allow for decisions to be made regarding levels of competency and assists in the development and or confirmation of the standards.

The third activity: The initial stage of the level 4 assessment - determining the rubrics.

At level 4 the assessment of higher order competencies needs to be addressed in all units of the competency. The starting point was the mapping of the various assessment tasks to the units of competencies. The matrix is illustrated in Table 6.

Data from 8 level 4 students and 14 trainers has been collected and will be collated to confirm the scoring rubrics developed for each task.

Unit	Activity	Domain	Task
OHS	Questionnaire	knowledge & interpret	2
	Training request	application	3
FLM	M'ship of AAMP	attitude	folio
	Indemnity insurance	attitude	folio
	Training record	skills	folio
	Mentor problem	interpret & apply	4
	Peer review	manage	9
Ergomotricity	PS training issues	knowledge	7
	PS analysis	interpret	group
	PS activity	application	8
Adult education	Level 4 A&WT	skills	folio
	TD key pts FCM	skills	6
	Posters	creativity	5
Reflective practice	Self assessment	reflection	1
	PD plan	plan	10
	Course evaluation	reflection	11

Table 6. AAMP Level 4 matrix

Conclusion

These pilot activities, undertaken as preliminary stages of the research project, indicate that it will be possible to develop the AAMP assessment protocol in a standards' referenced framework and analyse the collected data using QUEST to ascertain if the measures are reliable and valid.

The draft Rubric blue print for the larger study is illustrated. Table 7. It is anticipated that the analysis will be able to be undertaken both along and across each unit of competency.

Research	Research	Research	Research	
	Demonstrates competency in both health and load streams	Active in AAMP Executives		Level 5
		Manages own business/ Department		Level 4
Certificate IV A&WT	Analyses and adapts tasks using foundation concepts		Integrates concepts of skill acquisition, OH&S and training	
		Organises co training opportunities		
Trains small groups	Problem solves using Manutention concepts		Provides training in compliance with organisational OH&S	Level 3
Plans appropriate training intervention	De-constructs and combines FP&As and APA&Hs in exercises and tasks.			
		Organises Cert III assessment opportunity		Level 2
Demonstrates activity using triple demonstration	Appropriate use and explanation of FP&As in exercises and activities		Understands legislative framework	
Assesses peers			Discusses the anatomical and ergonomic basis for FP&As	
	Models FP&As		Works in a safe manner	
Adult Education	**Ergomotricity**	**Front Line Management**	**OH&S**	Range

Table 7 Draft Rubric Blue Print

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