

CHAPTER 7

FINDINGS AND CONCLUSIONS

7.1 Introduction

This final chapter aims to present the findings of the study, answer the original research questions and integrate the information into a few critical conclusions. Much of the literature reviewed presents information that is in some way relevant to enhancing the H&S efficacy of mineworkers. Some of the sources provide positive guidelines, while others present serious cautions. The previous chapters all concluded with relevant findings. This final chapter, however, aims to integrate the different chapters and disciplines into more significant findings. These are discussed thematically below in four sections: firstly, support for the self-efficacy concept; secondly, key formulations that apply to conceptual approaches to H&S training; thirdly, addressing the formal requirements of the study; and, finally, findings that relate to H&S training more widely.

7.2 Findings that inform conceptual approaches to training

Key formulations

This section presents the ideas and formulations, from the literature reviewed, which elicited consistent or compelling corroboration in terms of their application to and ‘fit’ with the focus of this study. These key formulations were either supported across the topics reviewed; correlated to comparable ideas across the disciplines forming a kind of consensus; or were established by evidence or insights that were compelling and well rationalized.

Support for the self-efficacy concept

The literature reviewed in Chapter 3 revealed that the self-efficacy concept has survived time, criticism, numerous research studies, and many diverse applications. It has been verified in different practical and cultural settings. Research conducted outside South Africa has found that self-efficacy belief is a stronger predictor of subsequent performance than past performance or other motivational constructs (Klassen, 2004:206), and is a critical determinant of self-regulation (Pajares, 2002:5). As shown in Chapter 1, self-efficacy has been used in the South African educational, training and development context with varying degrees of engagement with the original concept, such as: developing Defence Force officers (Stadler & Kotze, 2006); supporting previously disadvantaged university students (Wood & Olivier, 2004); developing teachers (Wood & Olivier, 2008; Rudman & Webb, 2009); and investigating the entrepreneurial tendencies of different ethnic groups (Urban, 2006). It has also been used by the Soul City Institute in Johannesburg (Goldstein et al., 2004:116). The term is used in previous studies of the H&S behaviour of mineworkers (Campbell, 2003; Campbell, 1997; Campbell & Williams, 1999; HEARD, 2002). An essential problem with self-efficacy is associated not with the concept itself but with the term, which is used widely and loosely, often with a shallow appreciation of the complexity of the concept and its task- and context-specificity. The utility of the concept lies in its operative qualities and deeper understandings of how efficacy can be addressed via its accepted sources and a clear focus on its task and context specificity.

As discussed in Chapter 4, the six sources of self-efficacy advocated by Bandura are widely used in the literature. These are self-concept; mastery; social learning; social persuasion; locus of control; and somatic and stress-reaction control (Bandura, 1994; Bandura, 1997:5517; Bandura, 1998:54-55; Bandura, 2004, 620-624;). The different sources of efficacy may be modified in ways to different degrees, according to the type of intervention. The study provided many examples of how the different sources of efficacy align with issues in mine H&S, especially in Chapters 5 and 6. There are too many to mention here. Furthermore, the concept focuses on efficacy rather than compliance, which has been a suggested shift by mining researchers (Hill & Pitzer, 2005:33; Phakathi, 2006:13).

Overall, the study finds that the self-efficacy concept is valuable in informing approaches to mine H&S training, but nuanced engagement with the concept, the possible sources of its modification and the task- and context-specificity of efficacy under consideration are essential.

Mastery and new learning

A clear thread running through the study is that learning, competence and confidence, i.e. experiences of mastery, enhance H&S efficacy. However, while essential, it is not the only requisite for H&S programmes. In terms of the self-efficacy concept, an individual's experience of mastery or successful performance is the most significant source of enhanced efficacy (Bandura, 2005:22-23; Kear, 2000:3). Social or vicarious learning was one of the founding ideas of Bandura's work. A development of this idea, parasocial interaction (Bandura, 1977b), using accessible media is relevant to H&S training in the context of the poor formal education of mineworkers. It has been used for silicosis awareness (MHSC, 2009b:7) and health promotion in South Africa more widely (Goldstein et al., 2004). Addressing the H&S mastery of underground mineworkers will usually require new content learning, in the context of ongoing technological development coupled with low levels of formal education that result in limited knowledge of pertinent subjects, such as lung diseases, geology, chemicals and electricity. The critical issue of new content learning is not adequately dealt with in any of the approaches covered in this study and requires more inquiry into relevant experience in related areas such as adult learning, health literacy and scientific literacy.

As suggested in Chapter 4, outcomes-based approaches have not always been well used in South Africa, though there is utility in formulating broad performance outcomes of training programmes. The effect of unit standards on approaches to learning depends on their logic, coherence and quality. Empowerment approaches allow for minimal assurance of curriculum and content. Transformative adult learning approaches advocate some form of critical challenge in the learning process (Cranton, 2002:66). Cognitive or intellectual challenge, embedded in the communication of content, may be critical to effectiveness.

As discussed in Chapter 6, health promotion research would suggest that such mastery can include accurate information, practical competences, coping skills, self-beliefs and negotiation skills that enable people to exercise control over their lives. Even studies of the influence of social capital on health efficacy, which generally have a collective focus, suggest that ‘intellectual understandings’ of the way in which social relations affect health are essential (Campbell & MacPhail, 2002:343). Naturally, the quality of instruction affects the development of mastery, and such quality is influenced by a full range of variables, including recruitment, curricula, materials, delivery mechanisms, assessment options, reward and reinforcement mechanisms, and, in particular, the qualities of the educator.

The established discipline of adult education has much to offer in terms of research and analysis of these variables, as does the substantial body of literature on the nature of adult learning and engagement with adult learners. An observation made in Chapter 5 was that the quality of training in the sector is a problem, an issue the MQA is currently addressing with further educator training (Frankel, 2010:44; MQA, 2010:62; MQA, 2011:91). Many of the core principles of adult education, such as learner-centeredness, respect for the adult learner and integration of learning and experience, remain important to the quality and effectiveness of training programmes. H&S trainers could learn much from the discipline. As suggested by one of the most enduring adult education writers, Jarvis (1995:99-100), in Chapter 4, much more research is required into correlations between adult learning and experience. A finding of this study is that learning needs to happen in H&S training, in the form of new content, skills, insights or behaviours, and that the issues of how the required teaching and learning can occur in the mining context are not adequately addressed in the literature reviewed and require much more interdisciplinary study.

Risk perception and management

Analytic approaches to H&S involving hazard identification and risk assessment are, as seen in Chapter 5, fundamental to the MHSA (Hermanus, 2007:536) and evident in the literature concerned with mine safety. Such approaches are endorsed as essential to H&S mastery in South African mining. However, health communication studies reviewed in Chapter 6 refer to risk perception and ways of facilitating a more accurate perception of risk to promote H&S efficacy via a number of mechanisms.

Research suggests that acknowledgement of risk can be activated by a feeling of personal vulnerability (Kiggundu, 2005:242; Campbell & Williams, 1999:15; Camlin & Chimbwete, 2003:231) or exposure to someone suffering from the condition under discussion (Camlin & Chimbwete, 2003:231). Risk can be displaced or denied through the following mechanisms: affect or intense emotion, othering, inaccurate information, dysfunctional comparisons, and notions of masculinity or machismo. An individual's belief in susceptibility to harm is also recorded as a relevant cognitive process in self-efficacy studies (Kear, 2000:5). More functional risk perception can be facilitated via accurate information regarding the issue or disease, its prevention, management or cure; or through self-efficacy, which involves the confidence and competence to accurately assess and avoid risk.

Liddell et al. (2006:224) advocate culturally sensitive models of risk for effective health promotion. As seen in Chapter 3, a central development in the self-efficacy concept involves a shift to *perceived* self-efficacy (Pajares, 2002:5; Bandura, 2005:25-26; Bandura, 1977a:204-205), confirming the role of perception and belief in efficacy, rather than a simple transfer of information and ideas. Risk assessment, management processes of safety training and the risk perception logic of health promotion do not appear to be integrated in the literature reviewed. An integration of these ideas may provide a more valid, comprehensive and grounded approach to risk in the training of mineworkers. A finding of this study is that the ideas found in health promotion literature regarding risk perception are not evident in the safety literature on risk management reviewed. Yet workers' perceptions of a hazard, its risk to them, and their perceptions of their efficacy and control in responding, are essential aspects of H&S training.

Existing and associated logics

A recurring concern in the literature of health promotion (Chapter 6) was that the H&S messages of training programmes cannot be simply transferred to workers. Such messages align, integrate or even compete with existing perceptions, beliefs, logics and experiences (Campbell, 1997:275; Campbell, 2003:25; Fearnley, 2005: 148; Charalambous et al., 2004:54; Donovan & Ross, 2000: 1899; Liddell, Barrett & Bydawell, 2006:223). In general I found very limited available research on worker perceptions, perspectives or beliefs regarding mine H&S.

These attendant beliefs or perceptions are complex, vary among different age groups and communities, and do not always compete with health messages, though they may complement them (Liddell, Barrett & Bydawell, 2006). Within South Africa, many such competing perceptions may stem from traditional beliefs and healing systems, but may also develop in the workplace context. For example, Charalambous et al. (2004:54) write about mineworkers' traditional reluctance to provide blood samples. Anecdotal accounts in mining record that some mineworkers believe that ear protection is bad because it causes ear fungi and they will not hear the start of rock falls. These are perceptions and beliefs of workplace origin. Airhihenbuwa and DeWitt Webster (2004) advocate a model, widely known as the PEN 3, for analysing such beliefs or perceptions, broadly as positive, existential or negative. The source and sensitivity of such beliefs may also be relevant, whether they emanate from a valued cultural system or the workplace, and as such are more amenable to change. A finding in this regard is that the investigation and acknowledgement of existing and associated beliefs and logics of workers about a particular syndrome is essential to H&S programme planning. Ethical engagement with such beliefs and logics will inform the content and logic of H&S programmes and indicate possible challenges to new information and behaviour.

Team ethos or social persuasion

As seen in Chapter 5, the overall H&S culture of South African mines is described in negative terms in the literature (MQA, 2011:31; COM, 2010:129; DME, 2010:126; Hill & Pitzer, 2005:3). Yet the aim of changing the H&S culture of mines or companies may not readily reach elementary workers because of the hierarchical nature of mining companies and the physical layout of mines, described in Chapter 2. The collectively focused social capital approach is well represented in health promotion literature (Campbell et al., 2002; Campbell & Williams, 1999; Campbell & Mzaidume, 2001; Campbell, 2003; Chiu et al., 2008) in Chapter 6. The approach is, however, usually located in a broader social context than the workplace, and many of the factors contributing to wider social capital are beyond the control of H&S educators. Yet other health promotion specialists agree that social norms and circles of influence regarding the desired behaviours do matter (Goldstein, 2007:5). Perhaps H&S culture can be redefined.

For the purposes of this study, I make use of an integrated view of the H&S culture, immediate contextual influences and group norms which most directly affect elementary mineworkers, to which I refer as *team ethos*.⁴¹ Efforts to address H&S practices for sustained efficacy are for many reasons probably most effective if focused on and aligned to the level of team ethos. As seen in Chapter 5, mineworkers operate in small teams or panels underground, and H&S efficacy becomes most vulnerable at the interface between workers and team leaders (Frankel, 2010:39; Hill & Pitzer, 2005:27). This may be the only level where elementary workers have opportunities to negotiate control over their own H&S and where they are most influenced by their peers. The source of self-efficacy that most particularly applies to team ethos is social or verbal persuasion, which works in both positive and negative directions, as does the researched evidence of team ethos.

As seen in the evolution of the concept described in Chapter 3, self-efficacy is also task- and context specific (Pajares, 1997:20; Bandura, 1986; Kear, 2000:3), as is the functioning of a mine work team or panel. Furthermore, research has identified positive features of team ethos on which to build, such as ingenuity, pre-existing skills and knowledge (Phakathi, 2006:3), as well as workers' concern for sick or fearful colleagues (Murray et al., 2005:2023; Campbell (1997:278). The significance of interventions aimed at finding positive aspects of behaviour and culture with which to engage is emphasized by health promotion specialists Airhihenbuwa and DeWitt Webster (2004:7-12) in Chapters 5 and 6. Two findings thus emerge in relation to H&S culture or context: a) a priority focus for studies of H&S culture or context is the effect of work team ethos on the H&S efficacy of mineworkers; and b) an approach that integrates positive and neutral aspects of team ethos will be more effective than one that appears to rehabilitate.

Maintaining new learning and practice

A significant issue is the maintenance of new learning in the workplace, whether in the shape of knowledge, skills, practices, attitudes or forms of communication.

⁴¹ *Ethos* is a standard English word, and the meaning can be found in any print or on-line dictionary. The word *culture* has multiple meanings in South Africa, and its use in H&S is yet another of its arbitrary uses, though the term is used internationally. Mineworkers have other cultural systems, activities and affiliations.

Maintenance of learning naturally applies to mastery and how well it is facilitated, and also to the effect of a team ethos on such mastery in both positive and negative directions. A comparable issue is described as ‘technology transfer’ in mining. Chapters 4 and 6 made references to the recorded challenge of technology transfer and the degree to which training and innovation are not carried into the workplace (Willis & Hamilton-Attwell, 1998 and 2002; Macfarlane, 2001; van der Heever, 2002). Evidence from studies of HIV/AIDS and health promotion suggest that post-training strategies are required to sustain and support the outcomes of programmes and to address contextual barriers (Wellings et al., 2006:1707; Harrison et al., 2000:288-289; HEARD, 2002:3; Dickinson & Kgatea, 2008:14). Studies focused on lung health of mineworkers also emphasize the significance of tailored investigation of and communication with target contexts and communities (Goldstein, 2007:5; Grant et al., 2010:S43). Policy suggests that the mechanisms for maintaining healthy and safe practices in mining are inspectors and H&S representatives. Yet, as described in Chapter 2, there is a national shortage of H&S inspectors and the preparation and support of H&S representatives may be inadequate, as discussed in Chapter 6. This study found that definite post-training interventions are required to sustain and support the new learning outcomes of H&S programmes and to address contextual barriers; and that those strategies may be most effective if focused on the site of team ethos where new practices are most amenable to positive and negative persuasion.

Dialogic aspect

An idea that recurred across the AET approaches and is implicit in many health promotion approaches is that of dialogue, consultation or interaction, which is viewed as critical for the engagement of adult learners or target participants. It is a process for, rather than a source of, efficacy development and applies to all sources of efficacy. Dialogic space facilitates worker engagement with critical issues and enables the sources of self-efficacy. In South African AET, enactments of ‘dialogue’ have been over-simplified, misunderstood or poorly used, with the result of alienating rather than facilitating participation. The use of embarrassing ‘ice-breakers’ with adults in training programmes is a common example. Consequently, notions of dialogue and engagement require attention. Most of the AET approaches reviewed in Chapter 4 use the concept of dialogue, but the most useful for this study was the notion of *dialogic space* (Rule, 2004).

Dialogic space is a more substantive notion of dialogue and one that refers to pragmatic issues of time, trust, struggle and responsibility (ibid). As such, it offers more than other notions of dialogue avoids the covert, but redemptive, tendency of so much AET, also mentioned in Chapter 4, that dialogue takes place between two levels of being, one superior to the other. The following are examples of these: between the expert and the ignorant, as seen in H&S literature and the way mineworkers are described generally in the literature; between the educated and uneducated, as in the Leon Commission, described in Chapter 5; between the lost and the saved, as in missionary education; and between the enlightened and unenlightened, as seen in Freire and other emancipatory approaches. A finding of this study is that H&S programmes for workers requires dialogic aspects or spaces in order to facilitate worker engagement and to provide opportunities for workers and other stakeholders to interrogate and negotiate ways forward.

Summing up

The key formulations above provide a set of essential considerations in formulating approaches for specific H&S training programmes for relatively less formally educated mineworkers. These are:

- New learning required
- Risk perception and management
- Existing and associated logics
- Team ethos
- Maintaining new learning and practice
- Dialogic space or aspect

A suggestion of Bandura's, cited in Chapter 3, states that a 'goal in theory building is to identify a small number of explanatory principles that can account for a wide range of phenomena'; and that generality is facilitated by a focus 'on integrative principles that operate across differing spheres of functioning' (Bandura, 2005:25). The six formulations above constitute a few integrative, substantiated and reviewed considerations to inform the validity and quality of H&S training for the most vulnerable and neglected mineworkers. The intention is that these formulations constitute essential considerations for worker H&S training regardless of the modality or method used.

Inevitably, they will require further, specific, contextual investigation when programmes are designed for specific H&S issues. The key formulations have been extensively discussed and supported throughout the study and above; and are therefore tabulated into a basic framework of key questions and considerations for training authorities, practitioners, providers or other interested parties. The table below represents the core findings of this study.

Table 21: Key considerations for approaches to H&S training of mineworkers	
New learning required	<p>New learning required in the form of new content, new skills or new insights?</p> <ul style="list-style-type: none"> • What is the subject and form of intended new learning? • How will it be facilitated and what is the validity of the approaches, methods, materials, modalities to be used? • What evidence will indicate that learning has occurred?
Existing and associated logics	<p>Existing beliefs logics and practices affect uptake and maintenance of intended learning and messages</p> <ul style="list-style-type: none"> • What are the existing practices, beliefs regarding the H&S issue under consideration and the potential barriers to new learning? • What ethical research and engagement with existing logics and practices has informed training and post-training strategies?
Risk perception and management	<p>Integration of safety (risk assessment) and health promotion (risk perception) ideas</p> <ul style="list-style-type: none"> • What are target workers' real perceptions of the risk and its management? • How will perceptions and management of risk be addressed?
Team ethos	<p>Relates to studies of H&S culture, social capital and group norms</p> <ul style="list-style-type: none"> • What is the connection between desired practices and current team ethos? • What positive and neutral aspects of team ethos have been identified, as well as problems?
Maintaining new learning and practice	<p>Post-training strategies required to sustain new learning outcomes (skills, behaviours, attitudes) and address contextual barriers</p> <ul style="list-style-type: none"> • Has the specific site of operation, where new practices will be most vulnerable to negative persuasion, been identified? • What specific post-training activities are designed into programme plans to address post-training barriers?
Dialogic space or aspect	<p>Dialogic aspect of the programme enables interaction between workers and other stakeholders</p> <ul style="list-style-type: none"> • When and how are workers able to challenge, question, discuss, plan and practise new learning and H&S practices? • How are the dialogic aspects of the training programme to be managed and by whom?

7.3 Formal requirements of the study

Recalibrating self-efficacy

This section aims to resolve the original objective of the study to develop a conceptual framework, informed by the self-efficacy concept, and answer the research questions. The intention of the framework is to inform approaches to workplace H&S training and awareness programmes that not only go beyond informing workers of safe practices but are also underpinned by the rationale of developing worker self-efficacy for H&S. This includes consideration of those aspects of self-efficacy that can be developed by education, training and awareness programmes provided to mineworkers. Consolidating the data involves repeating some of the information. All of the six accepted sources of self-efficacy (self concept, mastery, social learning, social persuasion, locus of control, and somatic and stress reactions) are frequently applied to mine H&S issues. The literature of the different disciplines reviewed provided relatively more endorsement for some of these sources, such as mastery and social persuasion, but more research may provide a wider range of examples and change this observation. In addition, the six key formulations above emerged as significant considerations in designing approaches to H&S training for elementary mineworkers and other workers with limited formal schooling. These formulations are integrated into a tentative reconstruction of the sources of self-efficacy with reference to local mine H&S. See Table 22 below. An explanation follows the table.

Table 22: H&S efficacy of South African mineworkers: Sources of influence

This table presents an approach to H&S awareness and training that is informed by the self-efficacy concept. Adapted from: Bandura, 1994; Bandura, 1997:5517; Bandura, 1998:54-55; Bandura, 2004, 620-624.

Somatic and stress reactions

- Not usually addressed in H&S programmes.
- May be addressed by accurate information re diseases, sources of protection and treatment.
- Highly affected by issues of reward, e.g. bonuses, overtime payments, promotion prospects.

Self-concept

- Not usually addressed in H&S training.
- Can be influenced by other forms of adult education, e.g. ABET.

Mastery and new learning

- Learning needs to happen in H&S programmes in form of new content, new skills or new insights.
- Expanded and recalibrated for H&S training.
- Post-training support to sustain mastery.

Locus of control

- Most opportunity for negotiation of control of H&S at team level.
- Forms of dialogic space provide opportunity to discuss and rehearse control issues.

Risk perception and management

- Renewed approach integrating safety and health promotion ideas.
- Integration of perception, assessment and management of risk.

Team ethos and social persuasion

- Related to studies of H&S culture, social capital and group norms.
- Specific focus on work teams useful.
- Identify positive aspects as well as problems.
- Dialogic space enables interrogation of team norms.

Existing and associated beliefs and logics

- Affect uptake and maintenance of H&S messages.
- Ethical engagement informs training and post training strategies

Social and vicarious learning

- Forms of para-social learning media useful in context of low formal education.
- Related to studies of H&S culture, social capital and group norms.

Maintaining new learning and practice

- Post-training interventions required to sustain new learning (skills, behaviours, attitudes) and address contextual barriers.
- Ideally targeted at the level of team ethos where new practices most vulnerable.

Explanation of the framework

The resulting framework is specifically focused on the application of the self-efficacy approach. The six accepted sources of self-efficacy, according to Bandura (Bandura, 1994:n.p.; Bandura, 1997:5517; Bandura, 1998:54-55; Bandura, 2004, 620-624), are extended to nine with notes from the findings of this study. These are:

- Self-concept
- Mastery and new learning
- Risk perception and management
- Existing and associated logics
- Maintaining new learning and practice
- Social and vicarious learning
- Team ethos and social persuasion
- Locus of control
- Somatic and stress reactions

The nine resulting sources of efficacy development are not viewed as discrete but as overlapping and interrelated sources of influence. Consequently, there is no particular starting point, sequential staging or practical guidelines for practice. These would depend on the specific nature of the H&S issue being addressed and on other circumstances of the training programme. For example, a focus on positive versus negative safety practices tends more to team ethos and social persuasion, while confusion about different lung diseases tends towards mastery in terms of content or accurate information. The framework may show a bias toward occupational health issues due to the influence of health promotion approaches, but this is acceptable, as evidence of such training for mineworkers is so scarce. It would be repetitive to discuss each source of efficacy again. The main points are presented below. Mastery and social persuasion are extended. Mastery is emphasized because it probably relates most directly to the H&S topic or issue selected for the development of new knowledge and skills. This is a critical issue because, as stated before, H&S as a subject or generic issue for mineworkers is not addressed in the training literature reviewed in Chapter 5. However, sources of efficacy such as mastery could also be recalibrated.

For example, mastery is also influenced by associated beliefs and logics, accurate perceptions of risk, and opportunities for positive or negative social persuasion at the level of team ethos. Forms of dialogue or dialogic space enable all sources of efficacy and require relevant attention. This tentative framework is a set of ideas and does not in any way provide a curriculum outline; instead, it should be seen as an approach to comprehending issues in enhancing efficacy in the context of mine H&S of elementary workers. The role of different approaches and frameworks is discussed next.

The role of frameworks and models

The process of this study caused me to become extremely cautious about frameworks, models for and solutions to H&S training. Paradoxically, I learned a great deal from the mass of literature which was excluded from this study, because it advocated solutions to H&S or the training of mineworkers but provided little or no substantial evidence. In an ideal training world, the definition of a conceptual framework, cited in Chapter 1 as a set of ideas to ‘formulate and justify alternative conceptual possibilities’ (Keet, 2006:42), would be valid. However, reviews of applications of H&S concepts, models and frameworks suggest that they are often condensed, truncated, oversimplified or misinterpreted in practice and frequently reduced to a single PowerPoint presentation or slide. The original research aim to produce a conceptual framework was not informed by exposure to the number of skeletal guides and directives in the form of unit standards, targets, computer packages and simplified risk assessment models that are touted as H&S solutions. Abbreviated concepts and theories are sometimes used to provide expedient short cuts for the custodians of the H&S training of mineworkers. Yet, while practitioners need theory and concepts in order to become better practitioners, engagement with many different models and concepts is the ideal. As seen in Chapter 6, theoretical engagement is advocated in health promotion studies as a factor which enhances the effectiveness of programmes, and health promotion researchers make use of aspects of different models for facilitating enhanced health efficacy (Goldstein et al., 2004:116-117). As seen in both the review of AET approaches in Chapter 4 and in the experience of mine H&S, rigid adherence to or inappropriate application of single models do not provide solutions.

In Chapter 5, Badenhorst (2004:47) is quoted as stating that ‘there is not one model, method, approach or framework that is right for safety training and no consensus established.’ Theoretical engagement with models and ideas may provide practitioners with skills to formulate appropriate approaches or select from a menu of valid options, but any framework, model, or process selected or advocated for training is only part of a relevant approach to training and requires substantial interrogation and adaptation with reference to the specific site of its application. Risk assessment processes have been found to work best when they are adapted for specific local mines and H&S issues (Furter, 2007:5-16; Foster et al., 1998:337; Stacey, 2009:291-292). Tailored strategies were also advocated in Chapter 6 for TB (Grant et al., 2010: S43) and HIV health promotion. The study found that H&S training of mineworkers may thus be better served by a research-based approach, informed by concepts and theory, than by dependence on a single conceptual framework.

The research questions

This section also addresses the framing research questions of the study, listed below:

Research question 1: How can the concept of self-efficacy be applied to workplace H&S programmes for unskilled and semi-skilled workers in South Africa?

The endorsed concept of self-efficacy is recalibrated and adapted to local mine H&S. It is based on Bandura’s accepted sources of self-efficacy, which have evident links to examples in the mining sector. With reference to *how the concept can be applied*: Self efficacy can be addressed via its accepted or adapted sources and an understanding of its task- and context specificity. Nuanced engagement with the concept, the possible sources of its modification, the type of efficacy under consideration and the context of its application are essential. Naturally different sources of efficacy are addressed via different mechanisms or modalities in different settings, e.g. medical versus workplace training.

Research question 2: What are the key formulations (concepts, ideas) from related disciplines that have ‘logical relevance’ to the research issue, i.e. worker efficacy in H&S in South Africa?

Research question 3: Which formulations (concepts, ideas) are key contributions to a basic, foundational framework for worker efficacy in H&S?

Research questions 2 and 3 are dealt with together. The six key considerations in the table above are drawn from different disciplines and chapters in the thesis. They are the key formulations that apply to the use of the self-efficacy concept or to any other conceptual approach or model selected for mine H&S training. Research questions 2 and 3 are addressed by the recalibrated self-efficacy framework (Table 22) and the key considerations for H&S training (Table 21) above.

Research question 4: Does the tentative framework have meaning in the real workplace context?

The original proposal for this research included a limited pilot study, which was to test the meaning or validity of the tentative framework. This proved to be too ambitious because of the logistical constraints of access to mines for non-employees. The pilot phase of the proposed study was consequently cancelled. However, the validity of the findings may best be demonstrated by undertaking another research exercise, possibly interrogating the findings with privileged observers, custodians of H&S training or other genuine stakeholders in the process. However, the relevance and fit with the local mine H&S context of both the recalibrated self-efficacy framework (Table 22) and the key considerations for H&S training (Table 21) above have been consistently referred to both above and throughout this study.

7.4 Findings that have wider training relevance

Introduction

This section presents another set of findings of the study, those that have a wider focus than approaches to training. Although policy is not within the scope of the original research, this section includes comment on policy decisions, because of the critical and pervasive effect these have on AET approaches and practice. The convergent effects of national policy on mining, education and training are discussed in relation to their impact on the training of employed workers.

Existing policies also affect H&S training in terms of priorities and resource allocation. Furthermore, as suggested in Chapter 6, even when substantial research-based approaches are used to produce materials, dissemination by the MHSC, mining houses or trade unions has been patchy (Murray et al., 2011:S71). The underpinning substrate for mine H&S training appears to be flawed. This study is also located within a university department of Education Management and Policy Studies.

Policy effects of the NQF

National education and training policy is unhelpful in providing a policy context for the training of elementary mineworkers or other adults who lack formal schooling. The most recent and relevant legislation is the NQF Act of 2008. As discussed in Chapter 4, adult educators in South Africa have always raised concerns about the structure of the NQF because so many South African adults are excluded from the framework and unit standard-aligned training options. There are countless numbers of such workers, those whose schooling ended before the equivalent of NQF Level 1 or Grade 9, in mining and other industries that employ large numbers of elementary, unskilled or semi-skilled workers. Literature reviewed in Chapter 4 revealed that insignificant progress has been made in reducing adult illiteracy since the end of the apartheid era (Aitchison, 2008:1; Baatjes, 2008:206, 224; Aitchison & Harley, 2006; 98-99; Rule, 2006: 117), but the NQF Level 1 descriptor demands sound reading and writing skills (See Appendix A). NQF level descriptors apply to all unit standards-based training programmes, whether they are full qualifications or not.

Even if recognition of prior learning (RPL) is offered, workers may lack the informal skills to qualify in terms of the level descriptors. Anecdotal evidence suggests that level descriptors are not really applied during industry-based RPL processes and that the theoretical aspects of training are often simply ignored by providers. The preparation and training of such workers (H&S and other) is thus left to the discretion of employers or the training providers appointed by sectoral training authorities. Such workers can attend ABET programmes that offer subjects almost identical to those offered by schools. However, the reward for long and arduous ABET study is negligible compared to the effort involved for the adult learner. Other forms of training for such workers, including H&S, lack a policy substrate or formal regulation outside of school-linked ABET structures.

A further finding of the study was that the exclusion of the many South African adults who lack formal education (below NQF Level 1 or Grade 9) from the existing education, training and qualifications framework has facilitated the neglect of essential skills provision, such as H&S training, for many workers classified as elementary, unskilled or semi-skilled.

Logic and rationale of H&S training

The policy logic stated in the MHSA originated in the Leon Commission of 1994, with three discrete foci: task- or operator-specific training; ABET; and hazard-specific training. As discussed in Chapter 5, evidence that this logic is being implemented is only partially manifest in current documentation. The most positive evidence available is associated with task- or operator-specific training. The diminishing and low impact of ABET across the sector generally indicates that it cannot be viewed as a primary conduit for H&S efficacy. Only limited public evidence is available of H&S training for mineworkers that focuses specifically on H&S risks, rather than being attached to operator training with a focus on safe operations. A lack of effective advocacy and training around critical occupational health problems, such as lung disease, is reported in current research (Murray et al., 2011:S71), as well of H&S as a subject or generic issue for mineworkers (Frankel, 2010:45; DME, 2008:39). The most recent annual report of the MQA refers to only one detailed record of dedicated H&S training for the period 2009-2010, a skills programme for H&S representatives (MQA, 2010:53).

This appears to be a lapse in the system, or even a transgression of the rights to H&S of the most vulnerable mineworkers. However, the gap is an effect of the convergence of different policies. The first is in the logic that H&S can be facilitated via ABET and operator training, i.e. that H&S can be dealt with by being attached to operator training, rather than presented as a subject on its own. The second is the national education and training policy of the NQF, discussed above. Research reviewed in Chapter 5 reveals that half of all mineworkers formally employed left school before attaining a level equivalent to NQF Level 1 or Grade 9 (MQA, 2011:1). The proportion is probably much higher for elementary mineworkers. As described above, these mineworkers may lack the educational scaffolding for unit standard-aligned training or RPL processes.

Yet all mineworkers require H&S training or at least preparation for the hazards and risks in the workplace. At present, such preparation and training, a stated priority of all of the stakeholders in the industry, is left largely at the discretion of employers. According to research reviewed in Chapter 5, it is often either of poor quality or does not even take place (Frankel, 2010: 44; DME, 2008:37 and 63; Dias et al., 2007:8), and centralized guidelines are not provided by the sector education and training authority (de Leeuw, 2011:n.p.). The logic that H&S training can primarily be addressed via ABET and operator training (MQA, 2011:31), breaks down when faced with the constraints of the NQF and associated levels and unit standards. The training of countless vulnerable workers becomes ad hoc and lacks guidance or accountability. Two findings of this study relate to the current rationale of mine H&S training for elementary mineworkers: a) the current logic of H&S embodied in MHSA, with its three foci of task- or operator-specific training, ABET, and hazard-specific training, is not completely implemented as there is scant evidence of generic occupational H&S issues such as lung health of workers being addressed via training. Either the training logic or its implementation processes require renewal. And b) there appears to be no public, regulatory framework or set of guidelines for the H&S training or preparation of mineworkers who have limited formal schooling, yet may constitute the majority of and most vulnerable employees in the local mining sector.

Health and safety representatives

The role of H&S representatives in supporting, monitoring and advocating for the H&S of other mineworkers, as enshrined in the MHSA (Chapter 3, Sections 25-30), was discussed Chapter 2. However, the role is voluntary, without reward, and may be demanding. As seen in Chapter 6, comparable experiences of peer educators in industry suggest that the role is stressful and requires systems of skills development and support to avoid attrition (Dickinson & Kgatea, 2008:1). Training is proposed for 10 000 mine H&S representatives during the current training year (2010-2011) and 40 000 over the next five years (COM, 2010:129). The proposed training is designed according to an outcomes- or standards-based model, as outlined in Chapter 4. It is pitched at NQF Level 2, which is inaccessible to approximately half of all current H&S representatives (Rees et al., 2007:21) and is formally aligned with three unit standards (MQA, 2009:3).

The SAQA level descriptor for NQF Level 2 clearly demands fundamental literacy and mathematical skills (See Appendix A) beyond those of current H&S representatives. H&S representatives are ideally elected by their peers for their personal rather than their formal educational qualities. Yet unit standards-based training would exclude many elected representatives, and, as described above, one-off RPL processes would not necessarily enable their inclusion. As discussed in Chapter 6, scrutiny of the relevant unit standards suggests a strong focus on knowledge of legislation and documented procedures, as well as hazard identification and risk assessment, with associated data gathering and reporting (See Appendix B). Information on other training options for H&S representatives could not be found.

Research into the perspectives of H&S representatives has revealed a generally inadequate understanding of their advocacy role in the workplace and the significance of dust as a hazard (Rees et al., 2007: 57). Yet the unit standards suggest little evidence of focus on increased mastery of occupational health issues or on the actual impact of the representative's role on the workplace or on the representative him- or herself. Communication and networking skills, reported to be essential in comparable peer education situations (Dickenson & Kgatea, 2008:14-15), also appear to be neglected. Based on available evidence, this study finds that the proposed training preparation of H&S representatives is inadequate for their proposed role and does not realistically accommodate their researched levels of formal education and language usage. Much more research is required into the workplace demands to be made on representatives, their existing abilities and logics, the experiences of peer educators or H&S representatives in comparable contexts, and appropriate training interventions.

Policy priorities

The H&S of mineworkers is always mentioned in policies and publications of the mining sector. However, a very specific focus on H&S training of the most vulnerable workers, those categorized as elementary workers, machinery operators and drivers, suggests that their health and safety promotion falls between different policy priorities. Section 10 of the MHS Act has clear requirements regarding H&S training of all workers, but compliance is extremely difficult to monitor on many widespread mines. The ever-increasing use of contract workers further confounds efforts to enforce compliance, as workers often move to different locations.

The more recent Mining Charter is concerned with transformation of the sector but makes reference to H&S and housing for workers (DMR, 2010:1-4). As described in Chapter 5, the most evident aims of the Charter are to transform the profile of power relations and resource allocation in the sector via changes in ownership, procurement and management (See: DMR, 2010:1-4). Health and safety as such are not addressed directly.

Scrutiny of the actual sector training plans also does not provide public evidence of specific priorities. The NSDS III was finalized by the DHET in 2011, with an emphasis on the effectiveness and efficiency of the skills development system (DHET, 2011:5). Sector training authorities such as the MQA have responded accordingly in their current training plans, prioritizing activities such as objective decision making, research, information management, monitoring and evaluation (MQA, 2011:129). Such priorities are valuable, but again do not give precedence to H&S. A finding of this study is that policies and directives, emanating from both the mining and education and training sectors since the MHSA was drafted in 1996, may have displaced H&S as a priority intervention for agencies in the mining sector.

Policy to practice continuum

Tripartite stakeholder consultation is probably the basis for most policy development in South Africa and the mining industry. As cited in Chapter 2, the primary reliance on stakeholder consultation for policy development and planning of education and development programmes in South Africa is being questioned. Realism regarding the dynamics; the feasibility and utility of the policy produced; the actual dispersal of vision and responsibility; and the unequal power of different stakeholders are raised as cautions (Jansen, 2002:207; Campbell, 2003:181; Hamman et al., 2008:23). In fact, different mining stakeholders are often intense competitors in the marketplace, and H&S records influence foreign investment in individual companies. Tripartite stakeholder policy developments in the form of goals and targets, such as the 2013 H&S Milestones and 2008 Tripartite Action Plan for H&S, are described in Chapter 2. However, available data indicate that local mining is not achieving the level of improvement needed to reach the milestones (Hermanus, 2007:535; Frankel, 2010:17). This evidence resonates with the experiences of Marschall and Shah (2005), cited in Chapter 5, regarding such policy-making processes.

Problems and targets are identified and agreed upon by a range of stakeholders, but the outcomes of such policy-making processes often lack underpinning, implementation plans and the operative power to facilitate change (ibid:172). The cautions of Marschall and Shah (2005) about primary reliance on stakeholder processes are corroborated by evidence that the 2013 goals are not being achieved and by a lack of substantial public documentation on how targets are to be reached or plans are to be implemented. Many skeletal PowerPoint presentations can be sourced on H&S targets, produced by most stakeholders in the sector, but few public reports and even fewer peer-reviewed journal articles on practice or achievement were found. A further finding of the study was that the stakeholders in the mining sector do not provide transparent and public evidence of actual H&S training of mineworkers to support their positive public policy statements made regarding mine H&S training, which in turn has a negative effect on their credibility; and especially on research and development undertakings that are not managed by stakeholders in the sector, such as university-based and post graduate research.

Pejorative tendencies

Much of the literature reviewed in this study presents a very negative view. Many issues in mine H&S provoke negative observations and findings, such as the very bad occupational health situation of mineworkers, the poor safety record of South African mines, and the unclear policy and training responses. This negative tendency is quite pervasive. Even in the most sympathetic literature, the most vulnerable mineworkers are described with the use of generalizations and terms that are ultimately pejorative. In health promotion and H&S literature, South African mineworkers are subject to generalizations that describe them as ignorant, uneducated, traumatised, powerless, diseased and without judgment, self-esteem or self-control. Their behaviour is often generalized as being typically that of risk-taking philanderers who indulge in substance abuse, as well as acts of violence and intimidation. H&S culture in mining is described simply as bad. Both the negativity and the tendency to generalize about the personal attributes of several hundred thousand people are unhelpful in formulating valid training and awareness responses. Such underlying tendencies may be reminiscent of the redemptive tendency of adult education (O'Sullivan, 2008:29) and the more destructive ideological bias in research (Chilisa & Preece, 2005:236), discussed in Chapter 4.

In fact, covert attitudes and tendencies can be more difficult for adult learners to deal with than those that are overt. In Chapters 5 and 6, the work of Airhihenbuwa and DeWitt Webster (2004:7-12) is cited because it addresses the issue of negativity in health interventions and suggests that a conscious goal should be to not only focus on bad aspects of a situation but also to promote the good and recognize the unique or indifferent aspects (ibid:7). The study found that much of the H&S literature reviewed had a very negative tendency, which is unhelpful in two ways: it provides a dysfunctional base for formulating approaches to training mineworkers, and an excuse for people of influence in the mining sector to avoid responsibility for the H&S record.

7.5 Perspectives on the findings

Validity

As stated before, the original proposal for this research included a limited pilot study, which was to test the contextual validity of the findings and conceptual framework. This would still be the ideal option, but would involve a primary research study in the workplace or interrogation of the findings with mineworkers, privileged observers, custodians of H&S training or other stakeholders. There does not seem to be a currently accepted term for the internal validity, credibility or truth of the study's findings. Brock-Utne (2008:10) described internal validity as 'how correctly the research portrays the phenomenon it is supposed to portray,' a challenge in the integration of different disciplines. Chilisa and Preece (2005) acknowledge the problems of confidence regarding accuracy and truth in qualitative research. They state: 'In qualitative research truth is multiple and subject orientated. Knowledge is therefore true to the extent that it represents the multiple realities, as revealed by the informants' (Chilisa & Preece 2005:235). This study does not consult informants directly, but makes use of multiple realities in its interdisciplinary approach. Many different perspectives on mine H&S are interrogated, and there are specific examples in the study where concepts and ideas relate directly to aspects of empirical research or reported experience. The findings in this study are composite ones, made after wide reading and deliberation, but they are made in a spirit of ongoing inquiry, research and development.

Significance and operative power

The significance of the findings above relates to its valid association with the topic and the context of mine health and safety training. This was discussed above and throughout the study. I do not officially represent any constituency, nor am I permanently employed by an influential agency or mining stakeholder. Spheres of influence in both AET and mine H&S training in South Africa are inevitably aligned to stakeholder constituencies, and adult educators do not constitute one that is recognized. Thus the sphere of influence of the findings of this study and their significance will depend on further work and writing. It was undertaken in a spirit of inquiry, and a key learning point was to find out how much could be learned from literature, even from an imperfect body of literature, and how much could be gained from interdisciplinary study.

7.6 Concluding comment

Summarizing the findings

It is necessary to summarize the many findings of the study before proceeding with the concluding section. The study found that the self-efficacy concept is valuable in informing approaches to mine H&S training, but nuanced engagement with the concept, the possible sources of its modification and the task and context-specificity of the specific type of efficacy under consideration is essential. However, review of the wider literature suggests that the H&S training of mineworkers may be better served by a research-based approach, informed by a number of concepts and theories, than by dependence on a single conceptual approach or framework.

Key considerations for formulating an approach to H&S training of mineworkers in the South African context are identified, regardless of the specific models selected. These are: new learning required; risk perception and management; existing and associated logics; team ethos; maintaining new learning and practice; and a dialogic aspect or space within the programme. New learning is required in H&S training, whether in the form of new content, skills, insights or behaviours. Strategies for the maintenance of such learning are also required.

Conventional risk assessment and management approaches could be enhanced by the integration of accurate risk perception approaches of health promotion studies. The investigation and acknowledgement of existing and associated beliefs, logics and practices of workers about the particular H&S issue under discussion are critical to facilitating and maintaining new learning and practices. A dialogic aspect to H&S training enhances the engagement of workers, provides opportunities for workers and other stakeholders to interrogate knowledge and beliefs, negotiate ways forward, challenge one another, and practise negotiating new attitudes and skills.

With reference to the current concern with H&S culture, the study has two findings. Firstly, a priority focus for such research is at the site of the work team ethos, because mineworkers operate in small teams in which H&S behaviour is most subject to positive or negative persuasion. Secondly, attempts to engage with such culture or ethos will be more effective when focused on positive or neutral aspects, rather than only on negative aspects.

The convergent effects of different policies affecting training of the most vulnerable mineworkers results in a situation where their health promotion and awareness is marginalized. H&S training is legislated in the MHSA, but compliance is virtually impossible to enforce. The logic of H&S training is most evidently linked to operator training and ABET. A lack of effective advocacy and training around critical, generic occupational hazards and risks, such as lung disease, is evident. National education and training policy is also unhelpful because unit standards-based policy places precedence on accredited training over advocacy and awareness programmes. Yet substantial numbers of mineworkers lack the educational scaffolding for NQF-linked qualifications and skills programmes. Their H&S training is left to the discretion of employers, and research has shown that such training is frequently not provided in the workplace. The proposed role of H&S representatives appears extremely demanding, and the associated skills training, outlined in public unit standards, lacks essential elements.

Finally, much of the literature reviewed has a negative tendency which is unhelpful in two ways: it provides a dysfunctional base for formulating approaches to training, and an excuse for people of influence in the sector to avoid responsibility for their H&S record.

Critical perspectives

The mining sector is still very powerful in South Africa, with the capacity to command its own policy and execute plans and even produce legislation. Yet the H&S training of mineworkers is not optimal or even adequate in its current form, especially for those who lack formal schooling. The discussion below aims to interpret the findings of the study into a few critical perspectives from the point of view of an adult educator. It ends with propositions regarding the H&S training for those mineworkers who are probably most vulnerable and neglected, yet constitute the largest categories of employees in the sector. The discussion starts at the core focus of this study and works outwards.

Health and safety as a core focus

There are essential problems with the stated focus on mineworker H&S and associated training. A lack of effective advocacy and training around critical occupational health problems, such as lung disease, is reported in current research (Murray et al., 2011:S71) and is evident in the literature reviewed. Occupational H&S as a subject or generic issue for mineworkers is quite neglected (Frankel, 2010:45; DME, 2008:39). The quality of training is a reported problem and its delivery to the most vulnerable workers is left to the discretion of employers. The appropriate delineation of H&S as focus, subject or learning area for the most vulnerable mineworkers requires intense analysis, research and development, with particular reference to those issues that are generic to many tasks and occupations, such as lung disease. This could include research focused on worker perspectives; establishing how learning can be assured in terms of the content required and in the context of learning; key considerations prior to training, such as those that emerged in this study: new learning required; risk perception and management; existing and associated logics; team ethos; maintaining new learning and practice; and dialogic space. Interdisciplinary and interdepartmental processes could initiate better research and development for H&S training.

Different kinds of dedicated and highly skilled professionals operate in H&S endeavours, in diverse fields and in disciplines such as medicine, pathology, mine engineering, geology and management. Such processes would require the working together of the most skilled practitioners in each relevant discipline, rather than only placing reliance on the bringing together of tripartite stakeholders.

H&S training: A business opportunity

The findings of this study, however, suggest that the training aspect of H&S still operates largely in the mode of a transient business opportunity, rather than a professional endeavour. Even the research reports of state-funded agencies are available at high prices. As a result, those in the sector who have the least economic power have seen their interests badly served, even in the post-apartheid era. There is scant evidence of the custodians or providers of their H&S training being subject to high standards of professional accountability. While working conditions and safety in mines have improved dramatically due to changes in labour policy and technological developments in recent years, occupational health has not. The current training approach often appears to be one of expedience, aimed at securing lucrative contracts from employers or sectoral training authorities.

Professional research, development and accountability

The literature frequently refers to the difficulty of accessing substantial research on H&S training provision. It is not possible to gauge whether the issue relates primarily to access issues or to the existence of such research. The competitive business bias of mine H&S inhibits access to research and the enabling of further research and development studies conducted by researchers who are not employed specifically in the sector, such as university departments. This includes post-graduate students employed in other institutions. The lack of public access to evidence of H&S training brings the transparency and accountability of the system into question. This could be addressed by all stakeholders in the sector. Furthermore, the credibility of different stakeholders in the sector can only be enhanced by public reporting.

Training opportunities for workers who lack formal education

There is discordance between the concern for mine H&S training frequently stated by the MHSA, which demands that all workers receive H&S training; and the national training policy of the NQF and associated levels and unit standards. Such NQF or unit standard-based skills programmes exclude the countless numbers of mineworkers who lack formal education, or the informal skills to cope with the RPL processes which would theoretically facilitate their inclusion. Other than formal ABET, training options for adults who lack formal schooling are unclear in South Africa.

Furthermore, the enduring logic that H&S can be addressed as a component of operator training is proving to be dysfunctional in addressing dire, generic occupational mine H&S problems such as lung disease. The H&S and other training options for mineworkers who are excluded by the NQF levels appear to be unregulated.

Critical conclusions and propositions

Consequently the study ends with six propositions as a positive contribution. These are made from the perspective of an adult educator.

Proposition 1: The most appropriate training or health promotion options for those H&S concerns that are generic to many tasks and occupations, such as lung disease, be investigated by professionals from all relevant disciplines and collated into an integrated plan for the most vulnerable mineworkers, by the relevant authority.

Proposition 2: Significant research relating to the H&S training of mineworkers, the content required, context of learning, perspectives of the workers themselves or other theoretical input, such as the five key considerations of the study, should be thoroughly investigated before H&S training programmes are funded.

Proposition 3: That the body perceived to be the highest authority on H&S training for mineworkers in the sector investigate the actual provision of H&S training and preparation for work of underground mineworkers; and that such information be freely available to researchers.

Proposition 4: The policy rationale and logic of the current mine H&S training system should be investigated and explicated by each and all of the relevant stakeholders and authorities, with substantial explanation about how the major threat to mineworkers, lung disease, is being addressed.

Proposition 5: Every opportunity should be used to publicize the predicament of countless mineworkers whose training (H&S and other) is marginalized because they lack the formal schooling (Grade 9) to cope with unit standard-aligned programmes, or lack the informal skills to be included via RPL processes.

Proposition 6: Public expenditure on mine H&S training and resulting programmes should become public information, available to all stakeholders, researchers and the public.